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The Psycho-Physical Effects of Daily Physical Education on Pre-adolescent Children.

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J.L.P.

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Abstract.

This study was initiated because of concern about the poor health record of the population in the West of Scotland, anxiety about low activity levels in pre-adolescent children, and the lack of systematic and regular physical education classes at primary school. A daily physical education programme was established in one primary school (Pilot Study) to examine the effects of an increase in time allocation to physical education on the motor fitness, affective development and academic performance of pupils.

Later the programme expanded to all primary 6 and primary 7 children in a community ($N > 400$) engaged in daily physical education (The Linwood Project). This programme was taught jointly by the class teachers and the specialist teachers of physical education from the associated secondary schools. Although there has been research into daily physical education in other parts of the world, to the author's knowledge, the combination of primary/secondary integration and daily physical education was unique to the Linwood Project. The project was part of a unified concept of physical education which is detailed in the study.

The children who were engaged in the daily physical education programme and the control samples

receiving 'normal' physical education programmes, were assessed before and after the daily physical education programme. Testing was conducted on motor fitness, academic performance and 'attitude to school'. There was additional monitoring by head teachers, teachers and parents.

The findings indicated that the children engaged in the daily physical education programme: had made considerable improvements in motor fitness and were superior to the children on 'normal' physical education; had at least maintained their progress in academic achievements, with some indication of superior attainment in computation at the primary 7 stage; tended to have more favourable 'school related attitudes' than the children on the 'normal' programmes.

Note.

Throughout this study all of the primary class teachers were female and the majority of the physical education specialist were male. To simplify the interpretation of the text the primary class teachers have been referred to as female and the physical education specialists as male.

J.L.P.

Chapter 1.

Setting the Scene.

It has been obvious to many physical educationists, primary school teachers and members of the medical profession that the physical education taught in most primary schools in the United Kingdom has been ineffective.

There is much emphasis in the media, by the medical profession and among the public at large on the need for physical activity and physical fitness. It is paradoxical that pre-adolescent children are so neglected in these areas. Public concern for the fitness of children has tended to be overlooked because it has been felt that young people are constantly active. However, in modern society children appear to have become progressively less active (Eriksson, 1973) and adult disinterest has not positively influenced the situation. Children, on entry to secondary school, are underachieving in physical education, and this could be due to inadequate primary physical education. Consequently the secondary school physical education teacher is in a 'remedial' situation (Pollatschek, 1979).

'Unfortunately, many schools have failed the children in this regard. School curricula tend to reduce the time available for physical activity rather than increase it.' (Bailey, 1976) Bailey emphasised that this situation had 'developed because educational authorities have adopted the premise that learning will progress as a direct function of the amount of time spent behind a desk.' (Bailey, 1976)

Among educationists it is felt that to give addditional time to physical education will mean a reduction of time on other aspects of the curriculum. If it could be shown that increased time spent on physical education could help in physical, affective and intellectual development and not be detrimental to the remainder of the child's development in other curricular areas, then it would be difficult to accept the present time allocation.

However, it could be arduous to convince curriculum planners and practitioners of the need for additional time to physical education in an already overcrowded curriculum. Research is required into the effects of increased time to physical education on the overall development of the child.

Chapter 2.

Review of the Literature.

2.1 Introduction.

It is intended to examine the total development of the child and place this in the context of the physical education provision for the child in this country and abroad.

Throughout life the psychomotor, cognitive and affective factors interact with each other as a process in human development and this study will review each domain with the emphasis on the pre-adolescent child. The psychomotor development of the child will be reviewed in three complementary sections: physiological factors, activity levels and physical development, and motor development. This sub-division permits an examination in more detail of the influences of nature and environment on physiological and motor growth and development.

2.2 Psychomotor Development.

2.2.1 Physiological Factors.

The most significant problem created by modern living has been the incidence of heart disease, 'the scourge of the 20th century' (Howe, 1982), and reported as the number one killer in many countries including the United States, Canada, Australia.

This modern plague which is the biggest killer of our time claims the life of one person in four in Britain (The Economist, 1983). At present Scotland is the coronary heart disease leader in the world. Professor John Farquhar, Director of the Stanford Heart Disease Prevention Program in California, warned that heart disease in Scotland was a national crisis and that attitudes would have to change (MacGee, 1981).

While the medical profession has concentrated on the treatment of coronary heart disease, evidence has mounted which indicates that treatment should be 'prevention' orientated rather than 'crisis' orientated. The main contributors to coronary heart disease have been identified as hereditary factors, cigarette smoking, high blood pressure, hyperlipidemia, obesity and lack of exercise. While cigarette smoking is probably the most obvious factor which is preventable other factors associated with the disease such as high blood pressure, obesity, diet and lack of exercise are inter-related.

There is a perceived relationship between participation in regular physical activity and reduced incidence of cardiovascular disease (Morris et al., 1953; Morris et al., 1956; Taylor et al., 1962; Kahn, 1963; Polednak, 1972; Fentem and Bassey, 1979; Kannel, 1979; Holme et al., 1981). Bailey (1976) is unequivocal when stating that physical activity is beneficial in controlling over-eating, mental stress and high blood pressure. Some authorities on stress claim that a high fitness level is the best way to combat the stress of life.

While occasionally pathological or organic disturbance is the cause of obesity it is more often an inactive lifestyle which is responsible. Mayer (1968) identified inactivity as the most important factor in the increasing overweight problem of modern western society. A large number of studies have shown that obese children tend to be relatively inactive (Bale, 1981; Bouchard, 1978; Godfrey, 1974; Margaria et al., 1964; Mirwald et al., 1981; Shephard, 1982). 'The obese child is restricted because of his being overweight, one cause of which is his lack of activity. Thus physical inactivity leads to obesity, and obesity leads to inactivity, creating a dangerous circle.' (Eriksson, 1973) Although obesity usually results from physical inactivity in the face of excessive consumption of calories, it would appear that obese children do not necessarily consume more food than non-obese children but that the physical activity levels in the obese children are reduced. What is of greatest concern is that obesity in adulthood can be associated with obesity in childhood and childhood nutrition (Bailey, 1976; Brownell and Stunkard, 1978; Coates and Thoreson, 1978; Garn and Cole, 1980; Hartz and Rimm, 1980). Overweight children tend to become obese adults (Armstrong and Davies, 1982).

It is known that the deposition of cholesterol in smooth muscle cells of arterial walls is resonsible for the development of atherosclerotic plaque in arteries (Carleton and Lasater, 1983). Although the risk factors associated with heart disease are more closely linked with the ageing process, Rose (1973) has pointed out that the first signs of arteriosclerotic disease appear around the age of 2 and, until the age of 19, the process is reversible. The 'fatty streaks' or lipid deposits under the inner lining of the coronary arteries are common in children regardless of geographic location, or diet, or both. These fatty streaks increase in number, size and distribution in the coronary arteries and are a feature by the age of 10. It is commonly believed that the fatty streaks progress to fibrous plaque between 20 and 30 years of age unless there is intervention at an earlier stage. Gilliam (in Miller, 1979), a health researcher at the University of Michigan, reported that 50% of the 400 children he had tested showed one or more risk factors for heart disease. Of 47 children tested, Gilliam et al. (1977) found that 62% aged between 7 and 12 years had at least one risk factor, and 21% had three or more risk factors. Wilmore and McNamara (1974) reported similar results in 8 to 12 year old boys. Armstrong and Davies (1984) established that coronary heart disease risk factors are frequently present in children and that '...there are enough cross-sectional observations to support the premise that the embryo of atherosclerosis commences early in life and is catalysed by certain so-called risk factors.'

Attempts to prevent or retard the atherosclerotic process should be directed at the pre-pubertal child before irreversible damage develops. The individual displaying the risk factors at an early age would appear to be the prospective coronary candidate in later life (Armstrong and Davies, 1982; Kannel and Dawber, 1972; Laird, 1975;

Naughton and Bruhn (1970); Strong and McGill, 1969; West and Lloyd,1976).

The inter-relationship of obesity, physical inactivity and level of lipoprotein has been demonstrated. It is recognised that high density lipoprotein cholesterol (HDL-C) plays a significant part in resistance to atherosclerosis. Adult studies have shown an association between sustained vigorous exercise and an increase in HDL-C levels (Enger et al., 1977; Huttumen et al., 1979; Lehotonen et al., 1978 in Armstrong and Davies, 1984). Together, they are inversely related to obesity (Armstrong and Davies, 1982). Evidence is mounting which suggests that regular intensive exercise during childhood increases HDL-C concentration (Saris et al., 1982; Wanne et al., 1983). In the investigation carried out by Wanne et al. (1983) normal 8-year old boys were classified according to their physical activity pattern. The active boys appeared to have 'healthier' lipid patterns than their sedentary counterparts. In a study of pre-pubertal Dutch children, Saris et al. (1982 in Wanne et al., 1983) indicated that the children with the highest aerobic power had higher HDL-C values than the children with lowest aerobic power. Armstrong and Davies (1982) recommend high energy expenditure activities which stimulate enhanced aerobic capacity. However, the intensity of physical activity must be high enough and frequent enough to promote a favourable change in plasma lipoproteins. The prevention of coronary heart disease must start during childhood.

Some would argue that there is a critical period in a child's life below which the effects of physical conditioning will be minimal or will not occur at all (Katch, 1983). This critical period coincides with puberty in most children, but may occur earlier in some. Katch recommends that programmes should concentrate on neuromuscular skill training for young children and physiological conditioning included when puberty is reached. While the skill centred approach is of importance, endurance will not improve as a result of this (Cureton, 1964).

From birth to adolescence is the period in which lifelong habits and behavioural patterns are set. Many strongly recommend that pre-pubertal children should engage in a comprehensive programme directed towards improving cardiovascular health (Cureton, 1964; Boyer and Wilmore, 1977; Gilliam, 1977). Change in lifestyle is the critical issue in the prevention of coronary heart disease with the emphasis firmly on aerobic activities early in life (Parizkova, 1972, Shephard, 1973, Anderson, 1976 in Hardmann and Almond, 1980), as early as 7 years of age (Boyer and Wilmore, 1977). Habitual physical activity early in life lays the foundation for possible lifelong coronary arterial disease prevention (Rowland, 1981).

A decrease in the rate of heart disease in the United States, Canada, Australia and Finland has come about because of an awareness by the public of the need to alter lifestyles through vigorous and intensive campaigns.

There is no evidence available which indicates that pre-pubertal children will be at risk from regular vigorous periods of physical activity. Rarick (1971) could find no conclusive research evidence to suggest that even the physical stress of competitive swimming and the prolonged periods of heavy training had an adverse effect on the physical growth of children. Astrand et al. (1963) from a longitudinal study of female swimmers from 7 to 16 years of age, and studies by Rarick (1960) and Sandstrom (1974), showed that regular physical activity favourably affects the growth of bone and muscle (Cureton, 1964). Eriksson et al. (1971 in Armstrong and Davies, 1984) found that the hard training undertaken by Astrand's swimmers had positively influenced their normal development and had no obvious adverse effects. Bailey et al. (1978 in Rowland, 1981) reviewed studies on childhood and adolescent athletes and found that athletic training and competition did not have 'harmful effects on the physical growth and development of the youngsters.' There does not appear to be a biological handicap in the participation by children in prolonged exercise. In fact they appear to respond in much the same manner as do adults at an exercise intensity of 50% maximal oxygen uptake (VO2 max) (Chausow et al., 1984). Macek et al. (1976 in Macek and Vavra, 1980) found that 'no significant difference of circulatory or metabolic parameters was found between boys with high physical fitness levels and trained adults.' While maximal heart rate is age dependent, the evidence from current studies (Rarick, 1971) on the work tolerance of children has shown that although the work capacity of younger children is less than that of older children, this is more a function of difference in body size than in the heart's capacity to respond to exercise. It is not the size of the heart which is important so much as the exercising of the heart. Oseid et al. (1969 in Armstrong and Davies, 1984) have shown that pre-pubertal boys are capable of working at 70%-80% of their VO2 max for in excess of one hour without exhaustion.

Rowland (1981) reports that there is no information to support common beliefs that females are inferior to males in strenuous aerobic sport. While results from many studies have shown pre-adolescent girls to have inferior fitness levels to boys this could be socially induced rather than genetic. Cumming et al. (1972 in Armstrong and Davies, 1984) reported that young female track athletes can sustain aerobic work at 60% -70% VO2 max for at least one hour.

Eriksson (1972) has shown that aerobically children have the same potential as adults per kilogram of body weight. While children demonstrate a low anaerobic capacity (Eriksson, 1972) it may be that they do not have a great need for anaerobic metabolism because of faster development of aerobic energy release at the start of exercise (Macek and Vavra, 1980). This indicates that children will tolerate endurance activities better than short duration high energy activities. It is now accepted that at the onset of fatigue most children stop exercising long before there is any danger to health (Komadel, 1971 in Shephard, 1984). However, it is important for adults working with children to realise that children tend to underestimate their state of exhaustion in comparison to adults (Armstrong and Davies, 1984).

Research by Astrand (1967, 1972), Buchanan and Pritchard (1970), Cheek (1971) and Bailey et al. (1973) suggest that the level of physical activity in the growing years may effect the functional capacity to perform as an adult. The need for physical activity is supported by Cumming (1976): 'Physical exercise is important during childhood for the proper development of the functional capacity of the heart, the lungs, and the strength of bones and muscles. If underdeveloped during the growing years, the opportunity for optimal development has likely been lost.' Houston (cited in Bailey, 1976) claimed that inactivity is very harmful and can cause noticeable demineralisation of bone in children and adults. He emphasised that the amount of activity the child gets is much more important than the amount of milk he drinks.

The activity schedule which the individual has followed in the early years will largely determine the capacity for physical activity. Ekblom (1971) states that after a training programme the maximum oxygen uptake (VO2 max) in untrained adults will improve, but never to the level of active athletes of the same age. While it is accepted that the limit of training response may be genetically determined (Klissouras, 1971; Rowland, 1981; Katch, 1983), it could be fixed early in life by the aerobic capacity established before or during puberty (Ekblom, 1971). There is evidence that even after a lapse from physical activity, the individual, who had developed aerobic capacity in youth, can be trained more quickly and to a higher level, in contrast to the untrained individual (Cureton, 1964). Since physical fitness does not depend upon natural skill or athletic endowment every child can be physically fit (Watkins, 1981).

Chaney (1978) stressed the importance of participation in physical activity for the proper growth and harmonious development of the child. Although it is important to encourage an early interest in aerobic activity that will persist throughout life (Pate et al., 1978; Smith, 1978; Zauner et al., 1980 in Rowland, 1981), activities should be selected which set out to exercise all parts of the body on the understanding that the individual will eventually choose activities suited to his interests, physical abilities and age. If motivation is poor or if the programme is inappropriate, then good results are unlikely. If the habit of regular exercise is established in childhood, a 'learnt behaviour' (Shephard, 1977), with the emphasis upon sports and activities which are enjoyable, physiologically beneficial and for lifelong participation, then there is a strong possibility that the individual will be active throughout adult life.

The Royal College of Physicians and the British Cardiac Society in their Report (1976) endorsed the health benefits of regular exercise. Fentem (1979) concluded that exercise '...should be seen as a necessary element in the pattern of daily living at all ages.'

Fitness and education for fitness from the earliest years are vital steps in preventive medicine. 'In terms of adult health the medical profession should direct some attention into what is taking place, or more precisely, into what is not taking place, within our schools to-day.' (Bailey, 1972)

2.2.2 Activity Levels and Physical Development.

Observation of young children indicates that they are very active individuals and that their impulse for activity is strong.

'No young creature whatsoever, as we may fairly assert, can keep its body or its voice still: all are perpetually trying to make movements and noise. They leap and bound, they dance and frolic as it were with glee.' (Plato, The Republic).

It is a widely held view that the pre-school child is full of energy. A high level of fitness may result from the vigorous daily physical activity associated with this age group (Hamilton and Andrew, 1976). The American Academy of Pediatrics (1976) regarded the pre-school child's characteristic large muscle activity as 'a self-imposed program of physical fitness.'

However, when children enter school they are no longer in a position to spontaneously play to the same extent as in their pre-school years. The allocation of time to physical activity must be shared between school and leisure. Fentem and Bassey (1979) state that young children will have their exercise capacity well maintained if they have the opportunity to be active. However, there is now evidence that children are not as active as they should be

(Shephard, 1984). Campbell and Pohndorf (1961) reported that physical educationists were becoming alarmed at the trend towards passive activities, such as television viewing, substitution of motor transport for walking and 'spectatoritis'.

In the United States there was evidence that youth fitness had not improved over the last twenty years and muscular strength and endurance had deteriorated (Hayes, 1984). Research from the University of Massachusetts, given to the Youth Fitness Hearings of the President's Council on Physical Fitness and Sports, indicated that children out of school were quite inactive and that they did not exercise at levels which would improve or maintain fitness (Freedson, cited in Hayes, 1984). Statistics from tests, conducted in 1979-80 by the Amateur Athletic Union in the United States and Nabisco Brands, with 4 million school children aged 6 to 17 years old, indicated that 57% of the children failed to achieve 'average' standards for a healthy child (Croce and Lavay, 1985). They blamed the reduction of time spent in physical activity for the dangerously low scores obtained by the children on the basic tests of fitness.

Farrally et al. (1980) in an investigation into the fitness of Scottish schoolboys aged 13, 15 and 17, found that the cardio-respiratory functioning of the Scottish schoolboy '... is not only inferior to his peers in other countries, but is probably inferior to his own predecessors.' However, in a similar investigation into the anthropometry and physical fitness of secondary schoolgirls in Strathclyde Region, Watkins et al. (1983) found that although the Scottish girls 'performed as well if not better than girls from other countries' in general endurance, they were fatter and less strong. The investigation also revealed that the Strathclyde girls were less strong than their Scottish predecessors of twenty years before.

Television viewing, one of the factors identified earlier, is a major problem in overcoming an inactive lifestyle. In an urban area of the Maurice Region of Canada, Shephard et al. (1975) found that boys watched television for 30 to 31 hours per week, summer and winter. Researchers in the United States indicated that 85% of the 6 to 11 year old children watched television each day, 98% watched television each week, with a weekly average of 26 hours (Cole, 1970). While McCullough (1957) found that television was the favoured recreation of 10 to 11 year olds in the United States, the children of the same age in Czechoslovakia picked sports as their favourite leisure-time activity (Muradbijovic and Sarajevo, 1970). According to figures published in 1976, 97% of the British school and adult population considered 'watching television' as their principal home hobby, and in the 5 to 14 year age group, the figures equalled one complete day in every week on average. Some children viewed for 6 hours a night, 6 days a week, with a 14 hour non-stop stretch on Saturdays (Temple, 1979). Cook (1984), reflecting on his son's lack of physical activity, concluded that it was not laziness in the boy, but a lack of encouragement which caused him to be overweight and inactive. The school did not have an active physical education programme and recesses were spent playing sedentary games. At home the boy played more 'sit-down' games or did homework.

During recess time in schools there is opportunity for children to engage in physical activity. However, Hovell et al. (1978) observed 300 children, 9 years to 12 years, and noted that the children engaged in physical activity for only 60% of the time. They also noticed that these activities were only half as vigorous as that required to produce an aerobic fitness effect. From this they concluded that children do not engage in sufficient aerobic activity in recess time to increase cardiorespiratory fitness. Professor Gilliam (Miller, 1979) stated that in America, today's normal active children, even those engaged in competitive sports, other than track athletics or swimming, seldom experienced the kind of intense physical activity that is required to raise the heart rate above 180 beats per minute and foster the development of a healthy heart. It has been argued that the innate activity of children is responsible for their 'boundless energy'. A study by Seliger et al. (1974) found that a small group of 12 year old Belgian boys participated in moderate physical activity for only 3% (43 minutes) over a 24 hour period. They also reported a Czechoslovakian sample where the boys spent 72 minutes per day on 'moderate' or 'medium' intensity activity. In a study of 2000, 14-year-old Swedish adolescents, Engstrom (1972, cited in Shephard, 1982) found that the boys devoted 42 minutes and the girls 30 minutes to vigorous activities each day. If this argument has validity then 'physical activity as a learnt behavior' (Shephard, 1977) is an important issue which cannot be left to chance.

In order for there to be an aerobic training effect the heart rate should be in the training band of 70%-85% of maximum (Green and Farrally, 1986). While it is difficult to be precise with pre-adolescents this represents approximately 140-200 beats per minute. Macek and Vavra (1980) recommended that the most appropriate form of physical training in children would be intermittant exercise. Klimt (1966, cited in Shephard, 1982) indicated heart rates between 160 to 180 beats per minute interspersed with brief rests during spontaneous play in young children. While spontaneous leisure activities in older children can produce 150-160 beats per minute for fairly long periods of time, this is not always realised (Shephard, 1980). Goode (1979) monitored the heart rate of one Canadian boy and found that his heart rate reached 150 beats per minute for only 7.5 minutes and that during a physical education lesson in school. Shephard (1980) reported observations which indicated that one hour of physical education or recreation often involves the child in no more than 5 minutes of vigorous effort. Goode (1979) suggested that during a normal gymnastics lesson the heart rate was only in the training zone 11 minutes out of 50 minutes. In the Trois Rivieres programme, Shephard et al. (1980) found that despite activity periods supervised by graduate physical educators who had been instructed to concentrate on cardiorespiratory development and muscular endurance, with maximum participation by the entire class, one hour yielded 15 to 36 minutes of vigorous activity with the class average heart rate from 157 to 175 beats per minute over this portion of vigorous activity. Seliger et al. (1980) found that in a non-intensified physical education programme lasting 25 to 36 minutes the pre-pubertal children's heart rate remained low (12 year-olds: mean rate = 125 beats per minute) and after deliberate intensification still remained rather low (12 year-olds: mean rate = 148 beats per minute).

The indications are that not only are children not as active in their leisure time as many would like to think (Hovell et al., 1978; Seliger et al., 1974), but it is apparent that physical education lessons have failed to increase cardiovascular efficiency. This may be a result of insufficiently demanding programmes (Hale and Bradshaw, 1978), commencement at too late an age (Shephard and Lavallee, 1977), the infrequency of programmes and poor utilisation of time for exercising (Dietrich, 1967). Physical educators should counteract the debilitating effects of low activity patterns by promoting high energy expenditure activities which stimulate improved aerobic capacity (Armstrong and Davies, 1982).

Cureton (1964) expressed concern about the play programmes of physical education and the fact that very seldom do physical education teachers view physical activity in the light of its effect on cardiovascular fitness. The need for cardiovascular endurance with the de-emphasis on skill games which cater for the endowed youngster was stressed by Boyer and Wilmore (1977). McNab (1983) stated that there is now more need than ever before for the purely physical, non-games element of physical education to be revised and he added that nowhere was it more necessary than in primary schools.

It is unlikely that physical education programmes will improve physical fitness unless they are specifically designed to do so (Cumming, Goulding and Baggley, 1969). 'If we want to improve physical fitness - and that should be the aim of physical education lessons - on the average, a pulse rate of higher than 140 beats per minute should be attained; many programs have not fulfilled this condition.' (Seliger et al., 1980) Rowland (1981) stressed the importance in assuring that a child is 'engaging in vigorous aerobic exercise (enough to cause fatigue) for at least one-half hour on a minimum of three occasions a week.'

While the best way to influence the child in lifelong physical activity patterns is for family participation in activities (Bailey, 1976; Boyer and Wilmore, 1977), the school physical education programme is an appropriate setting for the teaching of the motor requirements of youth (Seliger et al., 1980). Bailey (1976), in a ten year longitudinal study, found that, for every year that the child spent at school fitness decreased. Girls in their late teens were worst of all.

A sports orientated programme is inadequate for effecting cardiovascular fitness. A curriculum must be structured which includes activities that will place adequate levels of the proper kinds of stress on children (Gatch and Byrd, 1979).

According to a report from the UNESCO International Advisory Committee on School Curriculum (1958) the first objective of primary education is to encourage the child's development and teach him sound habits. Cumming et al. (1969) saw the principal objectives of the primary and secondary school physical education programmes being to teach the value of, and skills necessary for enjoying and participating in a large variety of sports and recreational activities not only during the school years but also in later life. However these programmes have, in many instances, emphasised the acquisition of sports skills, with the concentration on the athletically gifted, early maturing child rather than encouraging fitness and the enjoyment and value of physical activity for all (Harris, 1983; Rowland, 1981). The early experience of physical activity for many children is that it is only for the talented and not for the slow developer who becomes discouraged, lacks self-confidence, and at best becomes a spectator. In many primary and secondary schools, physical education is synonymous with elitism (Wilmore, 1982). 'There is nothing, I think, more unfortunate than to have soft, chubby, fat looking children who go to watch their school play basketball every Saturday and regard that as their week's exercise.' (John F. Kennedy, President of the United States, 1962 cited in Education Manitoba, 1980).

Boyer and Wilmore (1977) demanded that every child should be provided with an opportunity to engage in worthwhile, enjoyable activities to his or her full potential. Critics have regarded the current system of physical education and recreation as an almost complete failure with regard to promoting lifetime fitness (Pate et al., 1978). In the United States, testimonies from the Youth Fitness Hearings (1984) to the President's Council on Physical Fitness and Sports strongly suggested that fit children were more likely to grow into fit and healthy adults, while unfit children, unless there was some significant intervention like an effective school programme, would continue to display those traits into adulthood (Hayes, 1984). Unless there is awareness by physical educationists that they, along with significant others, have a responsibility to the health and fitness of their pupils, there will be a continuing increase in the rate of hypokinetic diseases. School physical education programmes should ensure that skill-related activities do not supersede aerobic exercise intended to foster lifelong fitness (Rowland, 1981). It could be argued that ability, grace and co-ordination are of secondary importance.

2.2.3 Motor Development.

The emphasis so far in this review has tended to focus on the physical fitness aspects of physical education. It has not been the intention to suggest that physical education is simply about physical fitness since the establishment of a genuine educative project for the teaching of physical education takes into account both the activities which encourage functional development and those which involve the acquisition of skills.

'Movement' came to prominance around the end of the 1930's after the arrival in England of Rudolf Laban. Laban developed a system for analysing movement whether it be functional ('doing') or expressive ('dancing'). Russell (1975) states that Laban suggests that while "doing" is purposeful and preserves life, "dancing" is necessary to recover from the strain of "doing" and as the primary means of expression from which the arts originate. The movement approach allowed for discovery learning and work at each individual's own level to 'produce a large quantity of movement' responses which would be 'repeated and refined under the skilful guidance of the teacher' to achieve quality of movement (Fowler, 1981).

The child moves through an orderly progression of gradual development from fundamental movement abilities to complex motor skills. On entry to primary school the child should have experienced the fundamental movement abilities of locomotion. The early years in school are devoted to developing and refining fundamental movement skill themes (stability, locomotion and manipulation) through exploration and with the guidance of the teacher, normally the class teacher. By the age of 8 or 9 years the child develops small muscle control, balance, perceptual qualities of hand-eye and foot-eye co-ordination and tracking. This phase has been described as the 'skill hungry' stage. The teacher is able to teach the skills of modified versions of recognised games and children learn to work with others and progress to co-operative or group activities. At this stage the children can evolve the rules of games as the situation develops with teacher guidance where necessary. The development of complex motor skills in the pre-adolescent years will lead the child towards more and more advanced forms which then tend towards those which are part of adult activity and which are governed by rules.

The neglect of appropriate physical activity at the pre-adolescent stages, identified and discussed earlier in the chapter, is also true in the area of motor competence (Murdoch, 1986). If the practice of motor skills at the appropriate stage of development is carried out through an effective physical education programme then special programmes to remedy clumsiness would not be required (Arnheim and Sinclair, 1975).

In addition to 'curricular physical education' Humphrey (1974) identified two other branches of physical education: 'cognitive physical education' which is concerned with the 'value of physical education as a learning medium in the development of concepts and understandings in other curricular areas', and 'compensatory physical education' which stresses 'education of the physical' mainly through perceptual-motor training.

The physical education contribution to the total picture should not be discrete from other areas of the curriculum. It should not contribute solely to the physical development of the child, but should also contribute to the affective and intellectual domains. 'Knowledge of the manner in which children develop is of prime importance, both in avoiding educationally harmful practices and in introducing effective ones.' (Central Advisory Council for Education, 1967)

2.3 Affective Development.

The ability of the child '...... to act, interact, and react effectively with other people as well as with himself' (Vannier et al., 1971) is an important objective of physical education. Within this the child can mature from the selfish "I" drives to the "WE". Competition can encourage and develop effective inter- relationships. In physical education the child is exposed to situations which encourage the feelings of esprit de corps, group success, and team allegiance. It is important that the teacher provides opportunities for the child to participate in activities which will promote the knowledge of rules, regulations, awareness and respect for others. Sportsmanship is a quality which must be planned for and encouraged by the teacher. In competition children must be encouraged to be 'good sports' who lose gracefully and win modestly. The teacher is used as a model and consequently must display , by example, all that is good in competition. Physical education frequently puts children into situations of challenge and in this the child can develop self - control, honesty, integrity, courtesy, dependability and moral values. 'Physical education contributes to the development of emotional control, since play periods are filled with emotionally charged situations.' (Schurr, 1980)

Many of the competitive activities in which children engage are dominated by adults and restricted to the talented, early maturing child. The children are often exploited by parents, teachers and coaches who put their personal ambitions and self-gratification first and the child, at best, second. The motto is 'win at all costs' and the stresses of adult life are transmitted to the children. There should be opportunity for all children, from an early age, to engage in a wide variety of physical activities which allow for enjoyment, winning, losing, co-operating, realisation of potential, appropriate physiological and skill demands, expression; and which include activities which can be pursued throughout their entire life spans. Much of what happens in school in terms of physical activity has the opposite effect, 'So enamoured are our pupils of sports that between 50% and 70% give it all up within three years of leaving school.' (Wood, 1973)

It is known that success in physical performance can positively influence self-concept (Zaichkowsky et al., 1980) and body-image (Harris, 1973). The child who distinguishes himself in physical activity may be more socially accepted which may in turn benefit intellectual and emotional development. There is potential for physical education to provide 'significant others' who can influence the self-esteem of the child. If the child is constantly rejected by 'significant others' then this will also influence the child in a harmful way. 'For the educator to ignore the marked influence that game success has on the social acceptance of children and adolescents is to ignore an important dimension of the value system with which youngsters are surrounded.' (Cratty, 1970)

Harris (1973) suggests that it could be that the major task of the physical educator is 'to provide selected experiences in movement and to emphasise the individuals active role in the process of discovery and refinement of the self.' The development of positive attitudes (affect) should be an objective of all physical educators (Zaichkowsky et al., 1975).

2.4 Cognitive Development.

Because of the value of active participation to children in the learning process, physical education can make an important contribution to cognitive skills.

It is the general opinion of educational psychologists that '... intelligence is not one ability but a collection of varied thinking abilities' (James, 1967), and that these abilities are influenced by interaction with each other and the environment (Harris, 1973). In addition, if '... knowledge and perception are not the products of a passive attitude but acquired by a very active process in which mobility as such takes a part' (Schilder, 1950), then the implication is that physical activity has an inter-relationship with intellectual development. It could be said that physical education is the element in the educational process in which there is education of the physical and education through the physical. Senator Lugar of Indiana stressed the strong connection between the 'decline in academic scores and the sorry state of fitness among our young people' (Hayes, 1984).

Physical and mental fitness are very closely inter-related. Cooper (1970) noted that employees in good physical condition were more alert, more productive and their morale was higher than unfit employees. A person cannot have absolute physical fitness without mental fitness since the mind and the body are interdependent (Edmundson, 1962). Mens sana in corpore sano.

The body/mind relationship, important since Greek times, is displayed more often in sport than in ordinary life. This is particularly true of decision-making activities which demand the combination of speed of thought and speed of body.

'If you wish to train your pupil's understanding, train the capacities which it is to control. Keep him in constant bodily exercise; bring him up robust and healthy, to make him reasonable and wise; let him work, let him be active, let him run about, let him make noise, in short let him be in motion. Once make him a man in vigour and he will soon become a man in understanding.' (Rousseau, 1762)

Zaichkowsky et al. (1980) suggest ways in which physical activity could contribute to cognitive development. It could: aid the development of intelligence through situations which demand creative, logical and quick thought; be used as a medium for stimulating problem-solving behaviour; provide an environment to enhance attention, short-term memory and sequencing ability; enhance children's global self-concept which could in turn lead to increased academic achievement; serve as a valuable medium for teaching concepts within the 'cognitive domain'. The most intriguing possibility is that activity stimulates psychomotor development and thus the cognitive process (Klainerova, 1974; Kodym, 1973; Le Boulch, 1966; Piaget, 1956; Pliva, 1977; Wallon, 1978 in Shephard, 1984).

Dewey believed that school is primarily a place for 'living' as well as 'learning': 'Experience has shown that when children have a chance at physical activities which bring their natural impulses into play, going to school is a joy, management is less of a burden, and learning is easier.' (Dewey, 1919)

2.5 Physical Education and the Primary School in Scotland.

The rationalist epistemology of Plato and philosophers like St. Thomas Aquinas regarded knowledge as independent of human experiences, absolute and largely unchanging. This theory saw education as a means to an end, the acquisition of a set body of knowledge, and the development of the intellect as the main aim. Knowledge was seen as 'God-given', and it suggested that '.. whatever the child himself brings into the educational situation can be ignored, discarded or even positively crushed as inevitably worthless.' (Blenkin and Kelly, 1981) Unfortunately the plans for education in Scotland as outlined in the the First Book of Discipline in 1560 did not give a place to physical education. In fact it implanted, in Scotland, a dislike for the activities associated with exercise (Ogston, 1905).

In the 18th century Rousseau was particularly concerned about the Rationalist philosophy and through his writing he became the first influential critic. In Emile he opened, 'God makes all things good; man meddles with them and they become evil.' (Rousseau, 1762)

Between 1816 and 1824, Robert Owen, a manufacturer, philanthropist, social reformer and one of the early educational reformers, set up a school in New Lanark. His philosophy was in tune with that of Rousseau and Pestalozzi. Owen saw mental and physical activities as complementary, regarding physical activity as a way of recreating the mentally tired. In his school physical education was an important part of the curriculum.

Around the same time David Stow, a Paisley merchant and Christian philanthropist, concerned with the squalor he saw around him in the city of Glasgow, set about changing the "training of the streets" believing that as bad habits could be developed so could good. 'What is contended for is, not the physical training in one place, the intellectual in another, and the moral in a third, but the whole each day, and under one superintendence.' (Stow, 1845)

However it was not until 1873 that physical education (drill) was recognised as a subject in the school timetable. The function of physical education in this period was, quite clearly, discipline (Small, 1982).

In 1876, HM Inspector, William Jolly, identified the neglect of physical education 'amongst the defects of our educational practice.' (Jolly, 1876) He also drew attention to Swedish schools where 'physical education is compulsory, from three to six hours being devoted to it weekly.'

Physical education has come through many critical evolutionary landmarks over the last century. There was a move from military drill to the Swedish system which was eventually supplemented by organised games and swimming. In 1919 the Board of Education recommended that a 'daily lesson in physical exercises is desirable in addition to time for organised games, swimming, etc.' (Board of Education, 1919a) with 'two daily lessons' for children under the age of seven.' (Board of Education, 1919b)

In 1933 a new syllabus appeared which recommended 'all activities likely to minister to physical health' (Board of Education, 1933) and included 'dancing'. The syllabus stated that the 'daily lesson' was most important otherwise it was not considered possible to 'secure steady progress in proficiency and a sustained effect upon the physical development of the child.' In 1936 Circular 1445 from the Board of Education and the Report of the Physical Education Committee of the British

Medical Association, recommended that 'a daily period should be devoted to some branch of organized physical activity in all junior and infant schools.' (British Medical Association, 1936) The Report of the Research Board for the Correlation of Medical Science and Physical Education recommended that the Ministry of Education should require Local Education Authorities to ensure: '...that every junior child in a primary school and every pupil in a secondary school should receive a period of organized physical activity on each day of the school week.' (Research Board for the Correlation of Medical Science and Physical Education, c1944) The association between physical education and the medical profession continued until the 1950's by which time the subject was generally accepted by both the public and the educators (Stevenson, 1974).

In 1950, primary education in Scotland (S.E.D., 1950) was seen as preparation for secondary education with the 'Qualifying Examination' the watershed at the completion of the Primary 7 stage. Subjects were taught in primary school using a timetable which ensured that each classroom was more or less the same. There was seen to be a need to measure progress and assessment was by examination.

The primary 7 curriculum was dominated by preparation for the 'Qualifying Examination' each February. Although physical education included games, eurythmics, and folk dancing there was still a strong emphasis on physical training, 'the ground work of the subject.' (S.E.D., 1950) In 1960, by way of the 'Syllabus of Physical Education for Primary Schools' (S.E.D., 1960), a national scheme of work, was issued. The 'Syllabus' was highly regarded by primary teachers in that it gave detailed lesson material on gymnastics, games and dance. This document continued to stipulate the required allocation of time to physical education, 'The Department (S.E.D.) adhere to the recommendation, made as long ago as 1920, that primary pupils should have a daily lesson in physical education.' (S.E.D., 1960) However, the 'Syllabus' was prescriptive and expected all pupils to approximate to an arbitrary standard.

Through the writings of Rousseau and subsequently Pestalozzi, Herbart, Froebel, Montessori and Dewey an educational tradition called 'Progressivism' was developed. In more recent years Neill, Isaacs and Hahn have translated and implemented this philosophy which holds the view that the child is an individual and that the focus of education should be on the child rather than being on a body of knowledge - 'child-centred' education.

In 1965 'Primary Education in Scotland' (S.E.D., 1965), the Memorandum, identified the 'needs' of the primary school child. The philosophy behind this document was influenced by contemporary advances in education, child psychology and society (S.E.D., 1980). It stressed that education should be based on the child's 'age, aptitude and ability'. These views questioned the use of didactic methods and the organisation and narrowness of the curriculum. The curriculum was to be reorganised into three areas: Language Arts, Environmental Studies and Aesthetic Studies, each to be apportioned equal status. The teacher's personal philosophy was to provide the basis for the curriculum and outmoded schemes of work were to be swept away. In-service training was given to allow teachers the opportunity to improve their knowledge of new curricular developments. These provided new approaches intended to foster the understanding of children as active participants in their own learning. A Working Party was set up by the Scottish Education Department to identify the differences between the guidance given on physical education in the Syllabus (1960) and that intended by the Memorandum (1965). Their Report (S.E.D., 1968) identified the main areas of physical education in the primary school as 'inventive movement', 'expressive movement', 'games training' and 'swimming'. In terms of time allocation the Report did not wish to make 'generalisations' and left it to 'the head teacher to ensure that sufficient time is available to provide a balanced programme.' (S.E.D., 1968)

'Progressivists' see education as a lifelong process. 'The educational process has no end beyond itself: it is its own end. .. Since in reality there is nothing to which education is subordinate save more education.' (Dewey, 1916) The shift of emphasis from the knowledge to the knower was reinforced by developmental psychologists, like Piaget and Bruner, who stressed the process model rather than the product, with the key concepts, '...those of development, growth, experience, activity, individualism, and, in general, child-centredness.' (Blenkin and Kelly, 1981)

Progressivism has been widely implemented in primary education through teacher training institutions, the advisory service, in-service training and national reports. Although some secondary schools have adopted or adapted a 'progressive' philosophy, most have been held back in curriculum development through constraints imposed by external examinations, and parental and employer pressure for vocational preparation. Consequently the philosophy of primary education differs quite significantly from secondary education. Perhaps unfairly, it is said that primary teachers teach children, while secondary teachers teach subjects.

The main features of 'progressive' education are included in the summary of the Plowden Report on Primary Education (C.A.C.E, 1967). 'A school is not merely a teaching shop, it must transmit values and attitudes. It is a community in which children learn to live first and foremost as children and not as future adults. ... It insists that knowledge does not fall into neat separate compartments and that work and play are not opposite but complementary. A child brought up in such an atmosphere at all stages of his education has some hope of becoming a balanced and mature adult and of being able to live in, to contribute to, and to look critically at the society of which he forms a part.' (C.A.C.E., 1967)

Although the immediate post Memorandum period provided an upsurge in new accommodation and materials, there was less money available in the seventies, fewer schools were built and fewer teachers were trained. Teachers already trained in new ideas were not being employed, resources dwindled and in-service courses disappeared in national economising. Much of the hope and enthusiasm generated by the 1965 Memorandum disappeared.

The Primary Memorandum (1965) had recommended the class teacher as the best person to teach physical education to her class. However, unless the school had the services of a visiting specialist in physical education, 'the generality of primary children began to receive a diminishing quota of physical education from their class teachers.' (Wilson, 1975) There were two possible reasons for this; inadequate amount of time spent in pre-service training in physical education, and the complexity of physical education in the light of the new problem-setting and problem-solving approach to physical education. In 1968 the Scottish Education Department found that 30% of 1625 primary classes spent less than 1 hour per week on physical education.

'...One reason that so many class teachers give so little time to physical education is that they feel inadequate to teach the subject.' (S.E.D., 1972) In the Stirlingshire Survey conducted in 1972, of the 824 primary teachers in Stirlingshire schools, covering all stages, 91% indicated that their pre-service training had not adequately prepared them to teach inventive and expressive movement (Wilson, 1975).

'The term "Expressive Arts" and the grouping of "subjects" probably owes as much to Topsy as to hard thinking about educational purposes and opportunities.' (Paton, 1982) It is a term which came into common currency in educational discussion in the early 1970's although it never appeared in any of the official documents of that time.

In 1979 a major investigation was completed by the Scottish Committee on Organisation in Primary Schools into the expressive arts (C.O.P.E., 1979). In this Study 'it was agreed that the term expressive arts would include art/craft, music, physical education and drama.' The survey was conducted on teachers who had graduated from three year diploma courses in Scottish Colleges in 1976. One of the findings indicated that in one College it was possible to graduate having received 28 hours in physical education and in another as much as 456 hours. The survey also indicated that few teachers had been asked, either on application forms (15.8%) or on interview (20.5%), about their training in physical education.

In 1980 HM Inspectors in Scotland conducted an evaluation of primary education at the primary 4 and primary 7 stages in 152 schools (6% of all primary schools) and produced the report, 'Learning and Teaching in Primary 4 and Primary 7' (S.E.D., 1980). In the survey the Inspectors examined the teaching of language arts, environmental studies, mathematics, music, art, craft and physical education to investigate 'what teachers were doing' and assess 'what children were achieving'. Tests conducted showed that teachers could take great satisfaction in the standards of achievement in the 'basics', 'numeracy and literacy'. However the conclusions from the survey indicated that there was 'assiduous and sustained attention, in isolation from the rest of the curriculum', on the 'basics'. This distorted the curriculum, and many classes were not achieving the balance of curriculum envisaged in the Scottish Education Department's memoranda on primary education in 1950 and 1965. In terms of the teaching of physical education the report disclosed that, 'most schools used the timetable to see to it that pupils had weekly "lessons". A third of P4 and almost half of P7 classes had more than one "lesson" each week.' The report indicated that the overall imbalance might begin to be redressed by 'a little more time to expressive and recreative activities; a little more direction and encouragement by headteachers; a little more support by authorities; and more sustained training for teachers.' "Expressive Arts" was used in the report to describe music, art/craft and physical education stating that 'all three activities have a number of characteristics in common which make it convenient to treat them as a group'.

In 1983 a 'Position Paper' was produced by the Committee on Primary Education (COPE) , 'Primary Education in the Eighties' (Consultative Committee on the Curriculum, 1983). This Position Paper set out to deal with the scope and balance of the whole primary curriculum, to examine the situation in 1983 and give pointers for the future. On the whole the Paper was well received by those who read it. It acknowledged the 'liberating influence' of the Memorandum of 1965 and set about trying to respond to problems, such as narrowness in the curriculum, identified in the survey of primaries 4 and 7 (S.E.D., 1980). The Position Paper laid down wide-ranging recommendations on curricular issues, responsibilities of teachers and staff development. For the first time there was emphasis on the involvement of the school in the immediate and wider community. One recommendation was for closer relationship between the secondary school and its associated primary schools to allow the pupils to 'experience education as a continuous process'. In the section entitled "Expressive Arts" the Paper indicated that in Physical Education, 'gymnastics, sports and games have taken precedence over expressive movement and dance.'

Central to the report, 'Education 10-14 in Scotland' (Consultative Committee on the Curriculum, 1986) was that 'every young person's education from 10 to 14 should be coherent, continuous and progressive.' The report identified clusters of related skills and understandings which were brought together as 'nine aspects of experience'. The Programme Directing Committee (PDC) viewed these 'aspects' as categories which would link the integrative approach of the primary school and lead into the modes and subject specific courses of third and fourth year of the secondary school. The report emphasised that part of the process in planning 'effective curriculum continuity' was in developing shared understanding coming from 'intervisitation and the exploitation of opportunities for teachers from secondary and primary to make a contribution in each other's classrooms.' (C.C.C., 1986, 8.46)

One of the nine aspects of experience, 'Physical Development and Well-Being', was seen by the

PDC as 'essential to a balanced 10-14 curriculum'. The report highlighted the importance the child attaches to physical development and its close relationship to physical and psychological well-being. The PDC strongly recommended the retention of physical education in S1 and S2 and that it should not be seen as an optional extra to children in the upper reaches of the primary school.

The need for a wide interpretation of physical education and the role that physical activity can play in healthy living for all was emphasised. The PDC identified the part schools could play in helping children to become aware of the factors that underlie health and well-being. Although healthy living was recognised as a curricular issue, the ethos of the school was seen to be fundamental to the message being accepted. The report stated the importance of the hidden curriculum to the development of well-being and the link between leisure choices and health choices as 'an important focus for schools'. Learning was seen as 'an action process of acquiring skills and understandings in order to make sense of, and live effectively in, the environment'.

"Expressive and Appreciative Activity " was another of the nine aspects of experience recommended in the 10-14 Report. Within this aspect the PDC identified 'the language of movement' through dance and gymnastics. What is of interest is that the '10-14' Report identified expressive arts AND physical education as curricular categories in the primary sector (p.108).

2.6 France.

As 1933 was a significant year in the history of physical education in Britain, so also was there an important development taking place in France. In 1933 Professor Latarjet of the Faculty of Medicine, University of Lyons, gave details of an experiment involving eleven-year-old girls. From the medically and physically weakest children in Lyons, thirty of the worst girls in terms of growth retardation and intellectual standards were formed into a class. They received two hours of physical education per day as part of the normal school day over an eighteen month period and were taught by a 'highly intelligent and active teacher who also had a good physical education qualification'. By the end of the experiment the children were not only physically superior to the non-selected group but their attendance improved (experimental - 53 absences: control - 1113 absences). The children did not fall behind academically as a result of the two hour daily physical education programme (McDonald, 1961).

The school year in France is long (thirty seven weeks) with a heavily weighted academic curriculum in the primary school. In 1951, influenced by the Lyons Experiment and by concern expressed by

French doctors and educators about the overloaded academic programme (23.5 hours academic: 2 hours physical education), the Ministry of Education set up an experiment in Vanves, a suburb of Paris.

The small Gambetta Elementary School in Vanves, under the guidance of Dr. Fourestier (the Medical Supervisor), set out to offer the children a programme which provided a greater balance between academic and physical activity. The experimental class consisted of 32 children of around 11.5 years and the control class of similar age in another school followed a normal programme. The initial experiment set out, firstly, to reduce to a minimum the number of hours devoted to academic subjects in order to achieve better physiological development and consequently a better 'intellectual and teaching efficiency'; secondly, to compare the experimental with the control class for intellectual, cultural, health, physical development, sports performances and certain affective factors. The results of the initial experiment were impressive. The experimental group were healthier, attended school more regularly, had an improved attitude and esprit de corps, were more attentive, performed better at sports, and perhaps most surprisingly performed better academically than the control class, despite being poorer at the outset of the experiment.

The experiment was conducted in isolated classes between 1950 and 1958, initially at Vanves, then elsewhere with similar results. In 1954 the Vanves model was introduced in some Brussels schools by Vander Stock (Chief Inspector for Physical Education in Brussels) and the results were similar to Vanves.

In 1960, Madame Böes, headmistress of the Gambetta School for Girls suggested to Dr. Fourestier that the experiment should be extended from experimental classes to the whole school. The daily programme was implemented with academic work in the mornings and the afternoons devoted to expressive arts. The 30 hour week was divided into three parts, 'le tiers temps pedagogique': 'Half of the time devoted to French and Mathematics (Basics), one quarter of the time to Sports Activities, one quarter of the time to artistic activities and the expressive arts.' (Böes, 1981) Between 1961 and 1969, with the agreement of the parents, Gambetta School operated as an experimental and pilot school in this way and was called "l'Ecole du Bonheur".

The Decree of the 7th August, 1969 changed the school week in France from 30 to 27 hours with an allocation of time to physical education from 2.5 to 6 hours per week (circulaire No. 69897, 1969). The decree indicated the importance of physical education to the total education of the child, emphasised the role of the multi-disciplinary teacher in the teaching of physical education, and stated that just as she had a responsibility to the academic areas so she had a responsibility to the physical education of the child. 'The essential objective of this "one-third teaching time" system is to break down the barriers between the so-called fundamental subjects, learning through discovery and P.E. and Sport.' (Guerpillon, 1976)

2.7 Canada.

At the 'National Conference on Fitness Health' in Ottowa, 1972, Professor Bailey (1972) of the University of Saskatchewan highlighted the need for more time to be spent on physical activity. Bailey identified problems which he claimed were a result of non-activity during school hours. These were problems of structural growth, functional growth and adult capacity, and positive childhood experiences. He described Canadian children in 1972 as, 'entering a society characterised by sedentary living patterns, emotional stress, poor dietary habits and lack of physical activity.'

Like Fourestier, Bailey stressed the 'over-emphasis upon academic education' which he felt was 'even more pronounced in the upper secondary grades'. The 'bold educational experiment' of Vanves was the recommended model which Bailey put to the Conferences of 1972 and 1973. At the latter, 30 minutes of physical education per day was specifically recommended. It is significant that Bailey should refer to Vanves since it has had a profound influence, 'the most motivating factor' (Martens, 1980), on Canadian elementary education.

The Canadian Association of Health, Physical

Education and Recreation (CAHPER) recommended that every child 'should have the opportunity in schools to experience effective daily instruction in physical activity.' (CAHPER, 1974) Martens and Grant (1980) surveyed 'Daily Physical Education in Canada' and their research found that 'teachers, principals and school boards pronounced the programmes eminently successful' and that 'there was overwhelming support for daily physical education'. They stated that, at primary school level in Canada, physical education was 'on the move' with the 1970's described as the 'Decade of Daily Physical Education'. In 1978 they located in excess of seventy projects related to daily physical education and they found that there was enthusiasm and a very positive attitude to the daily programmes. While all Canadian provinces reported involvement in daily physical education the intensity varied. The duration and type of experimentation ranged from formal to informal and from three months to in excess of six years. Saskatchewan, Manitoba and New Brunswick had daily physical education as provincial policy. However two of the better known studies in Canada have taken place in Quebec at Trois Rivieres and Pont Rouge, and at Blanshard Elementary School in Victoria, British Columbia.

The Trois Rivieres and Pont Rouge experiment was an eight year longitudinal study begun in 1969 with French Canadian children aged 6 - 12 years. The experimental group (250+) received one hour physical education per day taught by specialists and the control group (250+) received a regular 45 minute period per week taught by the class teachers. The programme emphasised the 'development of cardiorespiratory endurance and muscular strength, with maximum participation by all students throughout the class hour'. The results have shown that the experimental group were superior to the control group academically and in aerobic power and strength. Although the physiological gains did not appear until around the age of nine, 'the early beginning of additional physical activity can be justified on educational grounds of developing an activity habit.' (Shephard et al., 1979)

Due to the influence of Vanves a pilot experiment was implemented in a suburban Victoria elementary school. The Vanves results were repeated and a long term experiment was designed and put into effect at Blanshard. The four year study (1974 - 1978) at Blanshard Elementary School compared pre- and post-test results for all children in grades 4 - 7. The children underwent an increase in physical activity from 1.5 hours per week to an average of 3.5 - 4.5 hours per week. The programme was taught by classroom teachers. The general conclusion of the study indicated that, academic achievement remained the same, attitude towards physical education, towards school and towards self became more positive and that physical fitness improved (Martens, 1979).

In a report (based upon data taken from parents, teachers and pupils) submitted to the Department of Education in Alberta (Glassford et al., 1977), the research team recommended that 'the Department of Education and local school jurisdictions take the necessary steps to provide daily physical education at all grade levels, K through 12' and that for 6 minutes each day pupils should take part in vigorous activity such that the heart rate reaches the minimal training effect level during that period. The recommended duration of the lesson was to be a minimum of 30 minutes daily at the elementary level to 60 minutes daily in all grades at the secondary level. Recommendations also included the appointment of 'qualified internship co-ordinators and supervisors', the creation of a series of manuals to help the elementary school teacher in programme development and operation, summer workshops in physical education for elementary school teachers, and physical education courses for all prospective elementary school teachers.

In Vancouver the Physical Education Pilot

Project (P.E.P.P.) was initiated in 1977 to determine the effects of daily physical education on physical fitness, physical skills, academic achievement and attitudes of elementary school children. Five schools received a minimum of 30 minutes physical education per day over a two year period and five matched schools were used as control schools receiving their normal physical education. The results indicated that although the changes were not statistically significant at the 5% level, the experimental groups demonstrated greater improvement in psychomotor performance, cognitive performance increments and improved self-concept (Sinclair, 1983). The officials of the Vancouver School Board (Education Group) recommended that 'all teachers and administrators be encouraged to introduce quality daily physical education into their schools within a three year period.' (Sinclair and Appleby, 1979)

In Manitoba a survey carried out by the Department of Education found significant support (92%), from school division/ district physical education superintendents, for daily physical education/fitness as a desirable objective for their schools, and 72% of the physical education principals who responded felt that daily physical education was a desirable goal (Appendix A) (Manitoba Department of Education, 1980). In the St. Boniface School Division the physical education specialist has been used for skill development while class teachers concentrate on fitness activities. Fitness is now being seen as a way of life in these primary schools although the children appear to miss the daily routine when they go to high school (Teillet, 1980).

As part of the Ministry of Education's 'ongoing program of learning assessments', the 'British Columbia Assessment of Physical Education' was undertaken in 1979 with approximately 3450 children at grade 3 (8 years), grade 7 (12 years) and grade 11 (16 years), from 107 schools. One of the purposes of the assessment was to establish the 'existing status of students completing primary, intermediate, and senior secondary school Physical Education programs with respect to the cognitive, affective and psychomotor domains.' (Carre et al., 1980) Included in the major recommendations were: that the Ministry of Education strongly endorse the concept of daily physical education; to upgrade teacher qualifications for the implementation of daily physical education; that local school boards ensure the alloted time recommendations are met (Primary - 30 minutes per day; intermediate - 40 minutes per day; secondary - a daily lesson); that 'particular emphasis be placed on body fat reduction, cardio-vascular endurance, development of fundamental motor skills, and knowledge basic to physical education.'

In Ontario, the 28 Renfrew County Catholic Schools , as from September 1977, implemented a 'daily compulsory quality physical education program' (150-170 minutes per week). Teachers have commented on the 'positive effect on school atmosphere.' (Martens and Grant, 1980) In New Brunswick the Department of Education mandated that, as from September 1979, all children in grades 1 - 3 should receive daily physical education.

In Calgary the P.E.E.R. (Physical Education Evaluation Report) survey (1975) stated that ninety-eight per cent of the parents surveyed were supportive of the expanded physical education programmes in the primary schools.

From research conducted in Middlesex County, Ontario, the Final Report concluded that, 'the ability to achieve academically and develop socially does not appear to be affected detrimentally by the additional 90 minutes per week used for physical activity.' (Wearring and Banting, 1977) However Wearring (1981) warned that 'the content of a physical education class as well as the frequency with which some classes are offered is an important factor.' Wearring also concluded from his research that academic results could be influenced by motivation but 'lifestyle and attitude towards activity may be more important than "test scores" in developing young people.' He identified the influence of the teacher in providing a positive learning climate and the quality of the programme, as essential to the success of a daily physical education programme.

In Canada daily physical education is a reality recommended by children, parents, teachers and administrators.

2.8 Australia.

The concern expressed in Great Britain, Canada and the United States was shared by physical educationists in Australia: 'not many people in our profession can be satisfied with the deal primary age children are getting in physical education.' (Emmel, 1977) However, the most successful development in daily physical education would appear to be in Australia.

The appearance of daily physical education in Australia resulted from an investigation into the state of physical education at primary level in South Australia. Coonan (1980a) found that it was, '......taught in the main by teachers with little or no formal training in physical education. The end result of this practice was a failure by schools to provide the vast majority of primary students with a REGULAR, SYSTEMATIC, QUALITY PHYSICAL EDUCATION programme of SUFFICIENT INTENSITY to induce the beneficial effects of physical activity reported in the research.' With this in mind Coonan and his colleagues (1980a) carried out an extensive review of relevant literature and found the Vanves Experiment the most impressive.

In 1977 a pilot study (2

hours physical education per day) was set up at Hindmarsh primary school in Adelaide, South Australia. While the Hindmarsh Experiment was small the results were encouraging and in 1978 the SHAPE Study (School, Health, Academic Performance and Exercise) was established involving 500 ten-year-old children from 8 Adelaide metropolitan primary schools. Three classes in each school were allocated randomly to one of three groups: fitness, skill or control. The fitness (emphasis on endurance fitness) and skill (emphasis on perceptal motor skills) groups spent 15 minutes in the morning and one hour in the afternoon engaged in organised physical activity every day. The control group continued with the usual three half-hour periods of physical activity per week. Measurements were taken in the following areas: physical health, psycho-social functioning and academic performance. Although the programme lasted fourteen weeks the results indicated that 'the fitness groups in particular, and to a lesser extent the skills groups, made substantial health gains in comparison to the control groups.' Both of these groups also made significant gains in the psycho-social areas. While there was no adverse effect on academic achievement there was a trend in favour of the fitness group in arithmetic scores (Coonan et al., 1979).

In the 'Follow-Up' to the SHAPE Study two years later (Dwyer et al., 1982), which compared the original groups with the new groups, it was found that while the frequency of the programme had been maintained (daily), the duration of lessons had been altered from 75 to 45 minutes and the intensity of the lessons had also been reduced. The results from the SHAPE 'Follow-Up' clearly indicated that intensity was more important than duration of lesson in producing the reduction of coronary heart disease (CHD) risk factors.

In Queensland experiments were carried out using 15 minutes of fitness activities and 30 minutes of skill activities each day. The success of this approach resulted in a rapid increase in the number of teachers wishing to be involved in 15/30 daily physical education.

'1980 - 3 teachers
1981 - 72 teachers
1982 - 700 teachers

plus additional requests to be involved.' (Hay, 1982) In a similar 15 minute daily fitness programme in New Zealand, Lynch (1981) reported improved physical fitness and improved academic results. The aim of the fitness periods was to increase the heart rate to at least 160 beats per minute and to maintain that for as much of the 15 minutes as possible.

With experience gained from the SHAPE Study another project was conceived. The "Body Owners" Project (1980-82) set out principally to investigate 'which was the best way to achieve improvements in physical health status.' (Worsley and Coonan, 1982) This Project used four experimental groups, all receiving 45 minutes daily physical education: one control group; one group received health information; one group were encouraged to self-monitor health behaviours; the fourth group combined self-monitoring with health information. A fifth group, not involved in daily physical education, was also used. The results indicated that the physical health status of the children in the two groups engaged in self-monitoring increased significantly over the children in the other treatments. The parents of the children involved in the 'self monitoring' and 'receiving health information' groups expressed interest and approval for the programme and requested provision for school-centred adult courses.

From these studies Coonan et al. (1982) concluded that: daily physical education works; classroom teachers can have an influence on reducing coronary heart disease risk factors using a 'moderately vigorous, daily physical education programme'; daily physical education can work over a period of time, even when exprimental conditions are removed; 'the quality of the teaching and the pre-requisite quality of administrative and advisory support are perhaps the most critical factors in producing QUALITY programmes of daily physical education.'

The success and publicity from the SHAPE study identified the need for increased resource materials to implement a daily physical education programme. A group from the South Australian Physical Education Branch prepared the materials. The Australian Council for Health, Physical Education and Recreation (ACHPER) field-tested them throughout Australia, and sponsored by The Nabisco Company, launched the Daily Physical Education Programme in 1982. The programme was designed to make a lasting impression on the fitness and health status of over 2 million Australian primary school children. The principal aim of the programme is 'to develop in children an enthusiasm for physical activity and to maintain and encourage that enthusiasm so that they become committed to pursuing an active lifestyle.' (ACHPER, 1983) For this to be achieved the programme states that children must participate in a 'vigorous activity and a skill development lesson every day.' Susan Ryan, Minister for Education and Youth Affairs, stated that, 'in the face of alarming statistics on the health of Australians, especially children, it is extremely encouraging to see evidence of this sort of initiative, not to mention the dramatic results the program has achieved...This is very good news for my Government, and we will be seeking to work with ACHPER to extend this success.' (Ryan, 1984)

The 'quality of teaching' has already been identified as a critical factor in the success of the daily physical education objectives. Although there has been much justifiable criticism of centrally produced curriculum guidelines (Shiel, 1977; McTaggart, 1981; S.E.D., 1965), it has been recognised in almost every major study by researchers and teachers alike that teachers, under ever-increasing strain, do not spend time ploughing through theoretical books. In a hierarchy of needs, teachers require and want curriculum guidelines (class lessons), to build confidence and experience, which they then adapt and modify (Tinning, 1982; Dodd, 1984).

Most major studies also recommend assistance for the class teacher, preferably specialist co-operation (Tinning, 1979; Luke, 1983, 1984; Turkington, 1982; Williams, 1982; Dodd, 1984; Whitehead, 1986). Tainton et al. (1982) examined the effectiveness of a 15/30 daily physical education programme taught by classroom teachers. They found that the lessons were of low intensity and inefficient. The activities were repetitive, unchallenging and routine over time. They recommended that class teachers, with little experience, require the advice and help of a physical education specialist in order to make the programmes effective, interesting and wide ranging.

In South Australia the provision of the Daily Physical Education Programme has been supplemented by in-service provision only when a whole school commits itself to the programme. When this happens a physical education consultant works with the school for a year to initate the programme, starting with the daily fitness sessions. When this has been established the skill lessons are gradually phased in, until by the third term the full programme is in operation. One teacher in each school acts as a co-ordinator. The programme is strictly adhered to and at the completion of the year the consultant leaves the school but is still available as required and continues to provide new or updated material.

More than 50% of the primary schools in South Australia have taken on board the full programme of Daily Physical Education (Hawkins, 1984). Within six months of its launching in 1982, more than 2,000 primary schools had adopted the programme (Ryan, 1984). The Daily Physical Education manuals and workbooks were described by Moody (1984) as 'qualitatively and organisationally the best national movement in Physical Education of which I am aware. The promise of this campaign is enormous'.

A policy statement, 'Children in Sport', prepared jointly by the Confederation of Australian Sport, the Australian Council for Health, Physical Education and Recreation, and the Australian Sports Medicine Federation identified physical education as 'the part of a child's education which uses physical activity as the medium for education.' (ACHPER, 1984) They recommended that the physical education programme, throughout all stages of school, should include a daily lesson of 45 minutes duration (minimum) with a concern for the development of attitudes, knowledge and skills related to health, fitness and recreation.

2.9 Time Allocation in Other Countries.

While three countries, France, Canada and Australia, have been described at some length, it is not the intention to suggest that a change of emphasis on physical education is exclusive to these countries.

In Japan, physical education is the third most important subject in the primary school curriculum (Wetton, 1987). Maetozo et al. (1981) reported an average of 3 hours per week physical education in the elementary school, with 5 hours per week in sports club activities.

In China, as a result of a period of 'intense studies and cramming', the health of upper primary pupils deteriorated. The school authorities in Nanjing changed the curriculum by shortening class periods, reducing homework and stressing physical education. Some parents and teachers at first were concerned that the children would fall behind in their studies. All doubts were removed by the school's success (China Daily, 1985).

Primary schools, in the Republic of China, allocate 120 minutes per week to physical education, 75 minutes to morning exercises, 120 minutes to co-curricular activities - a total of 315 minutes per week (Tsai, 1975).

Ryan (1980) stated that, in the United States of America, the 'American Medical Association has long advocated daily physical education'. He asked for programmes which would produce and maintain physical fitness and encourage interest in lifetime sports, offered on a daily basis, in all grades. At the opening of the 'First National Conference on Physical Fitness and Sports for All', President Carter called for daily physical education in public schools. 'Fitness is the best possible investment in American Health.' (Caldwell, 1980) Kraft (1987) reported that 36% of children from grades 5-12 (9 years to 16 years) attended daily physical education classes.

The Council of Europe, in 1978, stated that the aim, in terms of time allocation, in primary education should be one period of physical education per day. The Council of Europe (1985) regard physical education as 'an integral part of education in primary schools; without physical education the education of children is incomplete. Three physical education lessons per week are the minimum. These will only be sufficient if children have stimuli, facilities and time for physical activities every day.'

The International Council for Health, Physical Education and Recreation (ICHPER) resolved, at the 1983 World Congress in Israel, to demand that 'all governments, institutions and individuals responsible for, and /or engaged in, educational and physical education and sports activities establish a minimum of one session a day of physical education, sports and recreation within the educational program of all grades of formal education, from elementary to high school' and all ICHPER members promote 'the attainment of an optimal level of physical fitness of students of all ages through adequate programs.' (ACHPER, 1984)

2.10 Scotland.

It was obvious to many teachers in Scotland that children, on entry to secondary school, were under-achieving in physical education (Pollatschek, 1979). Concern was expressed about the decline of standards in physical education in the majority of primary schools in Britain by Downey (1982) when he called it a 'national disgrace'. This is endorsed by Groves (1977), '... the full benefit of the work (physical education) in the primary school has not been felt, largely because there is a lack of teachers who can teach the subject. Apart from a few outstanding examples, the lessons I see resemble a bedlam of uninspired activity which satisfy neither the teacher nor the child.'

Thomson (1975) expressed the Scottish situation. 'The general consensus of opinion is that the majority of primary schools fail to provide regular adequate physical education. The profession (Physical Education) has been unhappy with the situation too long.' Pollatschek (1982) stated that many Scottish children were 'physical illiterates' and it appeared that many children were not engaged in sufficient physical activity in and out of school.

In a previous paper Pollatschek (1979)

stated that there was a need to examine the fitness levels of children in the primary school to find out whether the lack of systematic exposure to appropriate physical work was having a significant effect on their physical efficiency and potential. From reviewing the literature, at the time of writing, there is no evidence of a co-ordinated daily physical education programme in any region or area of Great Britain.

While the physical education scene in primary schools in the United Kingdom is uninspiring there are indications of progress. The Primary Education Advisory Panel of the Physical Education Association recommended 'that all primary schools offer a period of DAILY physical education.' The Panel also endorsed the four "areas of experience" in physical education: skilful body management, artistic/aesthetic experience through movement, games and game-like situations and learning in the outdoors. They also recommended that 'primary children have the opportunity to learn about and discuss those health-related concepts concerned with the care of the body.' (Whitaker, 1985)

It has long been recognised that time is an important factor in learning. To alter time allocation in schools is not a simple task since there are so many justifiable demands on the curriculum. The present shortage of time spent on physical education, especially in the primary school, has already been highlighted. Bloom (1979) described a number of 'alterable variables' which could bring about differences in the learning of children and adults, in and out of school. He stressed the need for 'time-on-task' with quality instruction. In terms of physical education this would suggest that there should be qualitative as well as quantitative differences in the learning experiences.

Prompted by many years watching highly motivated, skill-hungry, yet 'physically illiterate' pre-adolescents and by the Vanves experiment, research was initiated in 1981 at a primary school in Renfrew Division of Strathclyde Region. The study set out to examine the psycho-physical effects of a daily physical education programme on ten-year old children.

The aims of the Daily Physical Education Programme were:

a) to develop and maintain the physical fitness of the pupils;

b) to develop efficient and effective motor skills in pupils and enable the children to apply these skills to a variety of physical activities;

c) to develop knowledge and understanding of factors involved in attaining competence in, and appreciation of, physical activity;

d) to develop natural links, using physical activity as a learning medium, with other curricular areas in order to maximise coherent learning situations for children;

e) to develop and maintain positive personal attributes, interpersonal relationships, and a positive attitude towards participation in physical activity.

CHAPTER 3

Methodology.

3.1.1 Initial Stages.

In 1977 the adviser in physical education in Renfrew Division of Strathclyde Region expressed concern about the provision of physical education in primary schools (Pollatschek et al., 1986). After negotiations with, and approval from, education officers, he implemented an integrated physical education programme covering secondary schools and their associated primary schools. The concept was that the integrated programme would 'ensure development of the basic physical skills at the appropriate maturation point.' (Queen, 1977) He recommended that this could be done by adding sufficient staff to the existing secondary school complement so that the head of the physical education department could organise the specialists within his department to develop a common core of skills in all their feeder primary schools. In addition, Renfrew Division set up a three year research programme to examine: the function and role of the specialist in the primary school; the type of physical activities appropriate to primary pupils at the various stages of development; and the preparation of a physical education syllabus which could be used by specialists and non-specialists within primary schools and which would integrate with the secondary school physical education syllabus (Queen, 1979).

In November 1980 the head teacher of School A was approached by the researcher about the possibility of participating in a research project on daily physical education at her school. School A is situated in Linwood, once famous for its car factory and close by Renfrew District's principal town of Paisley. Since the closure of the car factory in 1981 there has been no main industry in Linwood. However, few of the population actually worked in the industry (approximately 700) and unemployment has been stable at approximately 25% of the 12500 town population (Regional Electoral Statistics, 1979-1981). Linwood could be considered to be predominantly of socio-economic group 4.

At the initial meeting between the head teacher and the researcher, the background history, rationale and related research to the project were explained and discussed. The head teacher was interested and a further meeting was arranged with a class teacher (teacher 1) who it was felt would be suitable for the project.

The researcher of the daily physical

education project was already a member of the research team in physical education in Renfrew Division of Strathclyde Region.

In 1979 the researcher and teacher 1 had worked together at School A on a successful curriculum project (The Climb). The philosophy behind this project approach and the integration scheme were recognised as important factors in the development of this daily physical education project.

After exploratory discussions within school A, the adviser in physical education was consulted and he was enthusiastic about the proposal. He regarded this research as a natural development of the Physical Education Primary-Secondary Integration Scheme (Queen, 1977). On 7th May 1981 an initial meeting, to examine the proposal, was arranged between the head teacher of school A, the adviser in physical education, an adviser in primary education, the education officer (Curriculum) and the researcher. Approval of the proposal was granted by Renfrew Division of Strathclyde Region on 8th May 1981.

However certain conditions had to be met. The parents of the children in the daily physical education class (primary 6) of school A were to be given an opportunity to meet the researcher, head teacher, and the class teacher. A meeting took place on 4th June 1981 between the parents of the children in the daily physical education class, the head teacher, the class teacher and the researcher. The rationale and research design were explained to the parents and they were also advised of the test battery which included physical, academic, and affective tests.

All parents were in agreement for the programme to proceed with the understanding that it would be continuously monitored by the head teacher and that any drop in standards would result in the programme being re-examined and the parents informed. If necessary the project would be discontinued.

School medical records had been checked for all children undertaking the test battery. Only one pupil was identified as having health problems (asthmatic). In this case the parents consulted the family doctor and the child was cleared to take the physical test battery. Since no other pupil had any record of ill health or disability, all were considered eligible to participate.

The initial project will be referred to throughout as the 'Pilot Study'.

3.1.2 Development - 'Linwood Project' (1982-1984).

Between 1982-1984 the programme expanded. In session 1982-1983 the programme extended to both primary 6 and both primary 7 classes within school A. The programme was taught jointly by the class teachers and the physical education specialists from the associated secondary school. By session 1983-1984 all five primary schools (schools A-E) in the town of Linwood were involved in the daily physical education programme. The programme was carried out at the primary 6 and primary 7 stages in the schools.

In May 1983 the decision was made by the adviser in physical education and the education officer (Curriculum), that the respective head teachers should be approached regarding the expanded programme and that the researcher should act as the co-ordinator of the project. At a preliminary meeting between the head teachers, the adviser in physical education, an adviser in primary education and the co-ordinator/researcher, the initial concept was discussed and approved. It was agreed that the head teachers should inform the parents of the additional time to be spent in physical education. At subsequent meetings the adviser in physical education and the co-ordinator/researcher, met with all class teachers and physical education specialists involved in the daily physical education programme and outlined the objectives of the programme. Issues regarding teacher confidence, specialist/class teacher roles, and re-allocation of time to other areas of the curriculum, were discussed. At these meetings the evaluations from the Pilot Study (Chapter 4) and first year of the Linwood Project were explained by the co-ordinator, and the classroom related material was outlined by a class teacher and an adviser in primary education.

In the expanded research two additional schools (schools F and G) provided the control group. These schools received two periods of physical education per week and are referred to as the 'Normal P.E.' group in the appropriate chapters. The expanded programme (1982-1984) is referred to as the 'Linwood Project'.

Class	Group number	Group	Numbers
Primary 6a	1	'Daily P.E.'	21
Primary 6b	2	'Normal P.E.'	23

Figure 3.1 Distribution of pupils in Pilot Study

1981-1982 School A.

3.2 Design of the Research.

3.2.1 The Pilot Study.

The Pilot Study was a 'quasi-experiment' with a non-equivalent group design which measured two school classes, a treatment group and a comparison group, before and after the treatment. The two classes had been matched on entry to primary school, in 1976, for an experiment which had involved parents in a pre-school reading project (MacDonald, 1981). The subjects had been matched by age, sex, socio-economic background and intelligence.

In this study, June 1981, there were 44 children, average age - 9 years and 10 months. One class (21 children) experienced physical education every day for one academic year and is referred to as the 'Daily P.E.' group. The matched primary 6 class (23 children) which received a 'normal' programme of physical education twice per week, was used as a control group, and is referred to as the 'Normal P.E.' group (figure 3.1).

Since changes from pre-test to post-test measurement were to be related to differences in treatment, it was necessary to recognise threats to internal validity. Such threats to internal validity in quasi-experimental research of this nature are not confined to intervention studies but can occur in a variety of settings, as, for example, when comparing progressive and traditional teaching styles (Galton, 1979). Cook and Campbell (1979) would classify the Pilot Study as an 'Untreated Control Group Design with Pretest and Posttest' which they state usually controls all but four threats to internal validity. The first threat which they identify is 'selection-maturity' effect where one group grows more experienced, stronger or more tired than the other group. While 'selection-maturity' is evident in this study it is not a major issue and is acknowledged where it appears. The second problem, 'instrumentation', arises in this study where an effect may be due to measurement inequalities. This appeared as ceiling effects in certain tests and is recognised in the analysis of results and discussion. The third threat, 'differentiated statistical regression', could be identified within certain tests in the Pilot Study and, where appropriate, it has been recognised that differential 'change' may not be attributable to the programme. The fourth threat, 'local history', refers to events other than treatment which may have effected one group differently from the other. Although the 'local history' threat is the most complex in this study, the events which may have influenced the groups have been identified within the text as Hawthorne effect, teacher characteristics, rivalry of children and parental intervention. These events have been recognised and, where appropriate, removed.

3.2.2 The Linwood Project.

In 1982-1983 the two classes which had been involved in the Pilot Study at school A, moved into primary 7 (43 children) and, together with the two new primary 6 classes (38 children), participated in a daily physical education programme. Consequently one class (group 1) from the Pilot Study was moving into its second year of daily physical education. A neighbouring school (school B) provided two classes as control groups receiving 'Normal P.E.', one at primary 6 (20 children) and one at primary 7 (31 children).

In 1983-1984 all five schools in Linwood at primary 6 (180 children) and primary 7 (170 children) became part of the daily physical education programme, the 'Linwood Project'. These schools will also be referred to as the 'Daily P.E.' group in the appropriate chapters.

The Linwood Project used the same research design as the Pilot Study, 'Untreated Control Group Design with Pretest and Posttest'. The threats to internal validity identified in the Pilot Study were also relevant to the Linwood Project and attention was paid to them in the light of experience gained in the initial study.

Since the original schools supplying control groups (schools A and B) had become involved in the daily physical education programme, new control groups were taken from neighbouring schools (schools F and G). Although associated with one of the secondary schools in Linwood, school F is placed in an affluent neighbouring town and the children tended to be from a higher socio-economic grouping (socio-economic group 2) than most of the Linwood children. The pupils in school F were tested in the academic and affective domains. However the head teacher decided to exclude her school from participating in the 'Daily P.E.' programme and pre-testing in the physical domain was not carried out there. It was not possible to pre-test in the academic and affective domains in another school before the summer recess. Pre- and post-testing in the physical domain was implemented using a Paisley primary school, school G. School G matched the socio-economic grouping of the Linwood schools. School F did agree to post-testing in the academic and affective domains. Schools F and G received two periods of physical education per week and are referred to as 'Normal P.E.' in the appropriate chapters.

All groups have been sub-divided into year stages. The 11 classes at primary 6 constitute 'Model

Year	Group	Number	School	Programme
1981-1982	1	21	A	'Daily P.E.'
1982-1983	4	38	A	
1983-1984	6	14	A	
1983-1984	7	24	B	
1983-1984	9	58	C	
1983-1984	11	37	D	
1983-1984	13	30	E	
1981-1982	2	23	A	'Normal P.E.'
1982-1983	5	20	B	
1983-1984	15	29	F	
1983-1984	17	40	G	

Figure 3.2 Primary 6 Model 1.

Year	Group	Number	School	Programme
1982-1983	2	20	A	'Daily P.E.'
1983-1984	5	29	B	
1983-1984	8	55	C	
1983-1984	10	43	D	
1983-1984	12	30	E	
1982-1983	3	31	B	'Normal P.E.'
1983-1984	14	23	F	
1983-1984	16	42	G	

Figure 3.3 Primary 7 Model 2.

Year	Group	Number	School	Programme
1982-1983	1	23	A	'Daily P.E.'
1983-1984	4	33	A	
1982-1983	3	31	B	'Normal P.E.'
1983-1984	14	23	F	
1983-1984	16	42	G	

Figure 3.4 Primary 7 Model 3

1' (figure 3.2) and the 8 classes at primary 7 constitute 'Model 2' (figure 3.3).

There is also overlap between classes which were used in the Pilot Study as control groups and in the subsequent year as part of the 'Daily P.E.' groups. They are valid members of the daily physical education group in Model 2 since they had not received special treatment when members of the control group in the Pilot Study.

Although the Linwood Project included the children from the Pilot Study, Model 2 precluded all children who had experience of two years of daily physical education. They are treated separately (Model 3). The children from groups 1 and 4 in school A participated in daily physical education in Model 1 and then continued in the programme at primary 7 (figure 3.4). These children consequently started primary 7 with one year's experience in daily physical education and by the completion of primary 7 had experienced two continuous years in the programme. To avoid confusion in the analyses of model 3, the children engaged in the second year of daily physical education are referred to as 'DPE2' and the 'Daily P.E.' children from Model 2, experiencing the programme for one year, are referred to as 'DPE1'.

The scores from the testing of the 'DPE2' children are compared with the scores from: - a) the children in the 'Normal P.E.' group of Model 2 - b) the children in the 'DPE1' group of Model 2.

3.3 Test Battery - The Pilot Study.

Since it could have been argued that a considerable amount of time had been spent on physical education at the expense of other aspects of the curriculum, it was necessary to monitor the programme and progress of the children before and after the study. From 2nd-13th June 1981 a battery of academic tests was undertaken by the two primary 6 classes at School A. It was accepted that after a long break from school, children would fall behind in their academic work and take several weeks to re-establish their pre-summer level. Consequently the academic tests were conducted prior to the summer vacation. From 31st August to 11th September 1981 the same children were tested on a battery of physical tests and affective tests. These tests were administered two weeks after the summer vacation to ensure that the pupils would have settled down and the normal administrative pressures on teachers, at the start of a school year, would have been overcome.

The testing was conducted on a pre- and post-programme basis for all children, 'Daily P.E.' and 'Normal P.E.'. The procedure for post-testing was the same as described for the pre-testing and followed the conclusion of the 1981-1982 'daily physical education'programme. It was also decided that the

TESTS	Pre-	Post-
Anthropometric Measurements	August	June
Flexibility Test	August	June
CAHPER Fitness-Performance II Test	August	June
Motor Control Tests	August	June
Staffordshire Test (Computation)	June	June
Gap Test (Reading Comprehension)	June	June
Gapadol Test (Reading Comprehension)	June	June
Edinburgh Reading Test	June	June
Attitude to Physical Education	June	June
Children's Behaviour Questionnaire	June	June
Children's Personality Questionnaire	June	
School Questionnaire (S7)	August	June

Figure 3.5 Pilot Study (1981-1982) Test Calendar.

pre- and post-programme tests should be conducted at the same time of the academic year to reduce possible contamination of results (figure 3.5).

To reduce any 'Hawthorne effect' or biased testing, those immediately involved in the teaching of the programme, the researcher and class teachers, were not involved in the administration of the test battery.

To monitor seasonal variations in physical fitness, mid-tests were carried out using the physical battery between 1st and 5th March, 1982.

3.3.1 Academic Tests.

In discussions with teachers and 'others' involved in the education of children the main apprehension had been that children, would fall behind in the basics of reading and mathematics. The academic test battery was devised to look at the competence and skills of the children in the basics of reading comprehension and computation. The tests selected, which were commonly used in many schools, were group tests, and were applied on a test and re-test basis.

Some had expressed fear that other areas of the curriculum might be neglected. In order to monitor the balance within the curriculum, the class teacher kept a weekly diary of her programme and of the children's progress throughout the year. At the conclusion of the project both class teachers were interviewed by a senior lecturer in primary education who was independent of the study (appendix B).

The Academic Test battery consisted of:

The Gap Reading Comprehension Test;
The Gapadol Reading Comprehension Test;
The Edinburgh Reading Test;
Staffordshire Test of Computation.

The Gap Test and the Edinburgh Reading Test were both administered and scored but, because of a ceiling age of 12 years 6 months in each test, they have not been used in the analyses.

The Gapadol Test

The Gapadol Test (McLeod and Anderson, 1973) is a sister test to the Gap Test but it measures to a reading age of 16 years 11 months. Gapadol is well proven and the school had considerable experience and confidence in it.

Gapadol is a comprehension test of the 'Cloze' type in which 'words from the text are struck out at random' (McLeod, 1978) and the child constructs his own response. Cloze-type tests 'have proven to be valid measures of comprehension and are decidedly more reliable and superior to conventional multiple-choice tests.' (Bormuth, 1967) They are based upon 'some coherent theory of reading' and give a useful measure of reading attainment (Vincent and Cresswell, 1976).

Although initially Australian, Gapadol has been tested throughout the United Kingdom and the results were in close agreement with the Australian figures. The data from the United Kingdom experiment were used 'to recalculate the scoring tables (i.e. test score to reading age conversion tables) for use in Britain.' (Thurston, 1984)

There are two forms of the test which can be administered simultaneously to a group of children, thus eliminating the possibility of cheating.

'The Gapadol tests are power tests rather than speed tests, and are therefore relatively free from practice effect.' (McLeod and Anderson, 1973)

While the test does indicate the above average and below average reader adequately, it was felt that the norms were outdated and consequently score interpretation may have been less meaningful (Thurston, 1984). However, in this study the comparison between the two main groups was a more important factor than comparisons with samples outwith this study.

The Staffordshire Test of Computation.

The Staffordshire Test of Computation comprehensively measures accuracy in computation for children between the ages of 7 and 15 years. This test examines 'knowledge of concepts in decimal currency, metric measures and in the more common commercial transactions.' (Hebron and Pattinson, 1974) Two purposes of the test are to place the pupil in relation to others of his age group and to estimate the 'arithmetic age' of the child.

The test consists of two sheets containing a total of 92 items of addition, subtraction, multiplication and division. The Staffordshire Test is untimed and measures up to an 'arithmetic age' of 14 years.

There are criticisms of this test in terms of some of the claims made in the Manual (Davies, 1984). However, the use of the test as a measure of the pupil's status within his age group is not criticised. The test was used to monitor the overall progress of the children.

<table>
<tr><td></td><td></td><td></td><td colspan="3">Physical Fitness</td><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="7">Motor Fitness</td><td></td></tr>
<tr><td colspan="9">General Motor Ability</td></tr>
<tr><td>Arm-eye co-ordination</td><td>muscular power</td><td>Agility</td><td>Muscular strength</td><td>Muscular endurance</td><td>Circulo-endurance</td><td>Flexibility</td><td>Speed</td><td>Foot-eye Co-ordination</td></tr>
<tr><td></td><td></td><td></td><td colspan="4">Organic soundness and proper nutrition</td><td></td><td></td></tr>
</table>

Figure 3.6: 'Chart of Physical Elements'

(Clarke, 1976, p.174).

3.3.2 Motor Fitness Tests.

The term motor fitness is relatively new and embraces all aspects of general motor ability with the exception of the primary factors, co-ordination and skills. According to Clarke (1976) the basic physical fitness elements are muscular strength, muscular endurance and circulatory endurance. The elements of muscular power, agility, flexibility and speed are added to the physical fitness elements to comprise motor fitness (Figure 3.6).

It has been explained in Chapter 2 that the frequency of physical education lessons does not ensure an improvement in general motor ability (Wearring, 1981). Indeed it has been shown from research (Harris, 1983; Rowland, 1981) that most physical education lessons tend to improve co-ordination and skills, and not the basic physical fitness elements of motor fitness. Frequency of activity is important to the development of motor fitness when it is accompanied by appropriate intensity of activity, appropriate type of activity, and appropriate duration of activity.

Consequently it is necessary to examine the effect of the daily physical education programme on the children, in terms of the claims made in Chapter 2, and in terms of the objectives for this study.

The test battery in the physical domain consisted of:

Body Composition;

Canadian Association of Health, Physical Education and Recreation (CAHPER) Fitness-Performance II Test;

Flexibility - Sit and Reach Test;

Basic Motor Control Tests - Co-ordination and Skills Tests.

Body Composition.

Although body composition is not an element of motor fitness, chapters 1 and 2 identified obesity as a risk factor in coronary heart disease and the relationship of obesity and lack of exercise. Consequently it has been included at this point in test descriptions.

Body composition is important in identifying obesity. Whereas laboratory methods are time-consuming in the estimation of body composition, field methods in the form of height, weight and skinfold thickness are relatively easy to administer. However it is necessary to exercise caution in the analysis of skinfold measures with children in the pre-pubertal stage.

Four relatively common skinfold sites were chosen; biceps, triceps, sub-scapula and supra-iliac. The four skinfold measurements were examined individually and were summed.

Skinfolds.

The loose tissue over the body can be grasped between the thumb and index finger. This skinfold reflects the fat deposits immediately under the skin. The thickness of the skinfold is measured using a skinfold caliper. In this study the

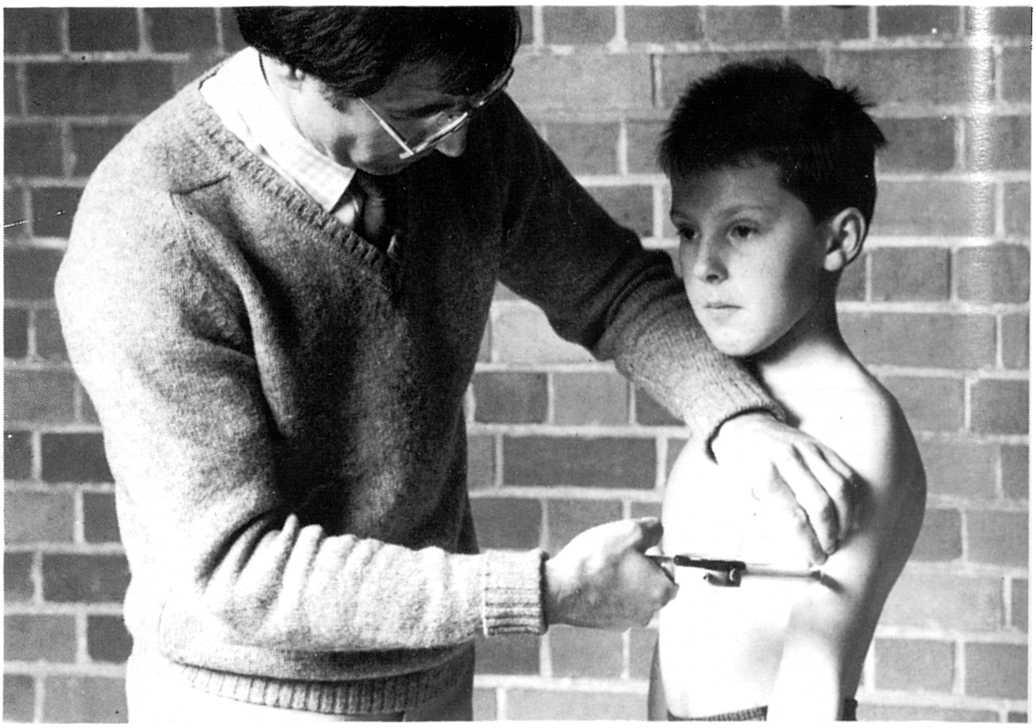


Figure 3.7 Biceps

Holtain/Tanner-Whitehouse Skinfold Caliper was used. This caliper measures from 0mm to 480mm, with a dial graduation of 0.2mm and constant pressure between the anvils of 10 gms/sq mm. Research into the reliability and validity of this caliper is well documented (Lohman and Pollock, 1981). However training and practice is essential for reliable and valid skinfold measurements. In this study an independent tester with expertise and experience in anthropometric testing measured the children throughout the Pilot Study. In keeping with tradition (Tanner and Whitehouse, 1962) all measurements were taken on the left side of the subjects. The measurements were repeated several times on each site and the skinfold thickness was recorded after 2-5 seconds of pressure, thus allowing standardisation of pressure and a constant value (Behnke and Wilmore, 1974; Verducci, 1980).

Biceps.

This measurement was taken at a point midway between the tip of the shoulder (acromion process) and the inferior anterior aspect of the humerus (trochlea/capitulum) with the skinfold parallel to the longitudinal axis of the upper arm. The site was located with the elbow flexed at 90 degrees but the reading was taken with the arm hanging, in a relaxed manner, by the side (figure 3.7).

Figure 3.8a Triceps

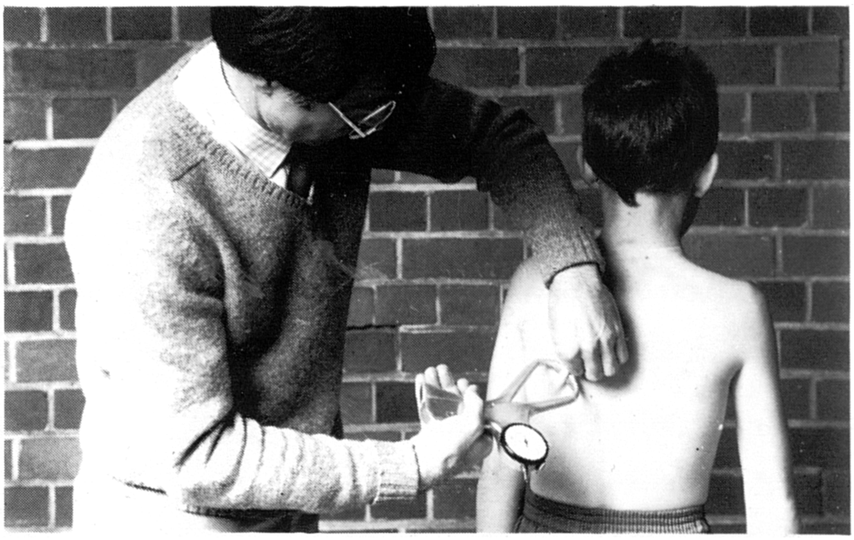


Figure 3.9b Subscapula

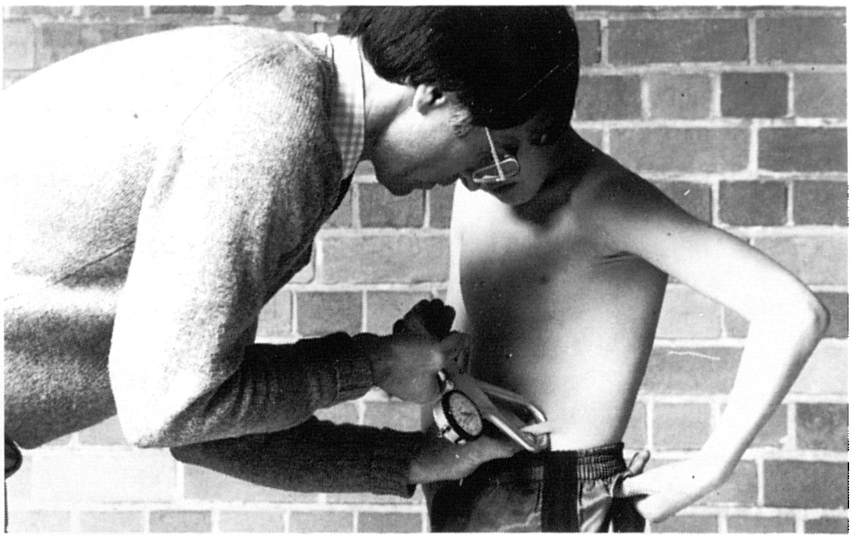


Figure 3.10c Supra-iliac

Triceps.

The triceps measurement was taken at a point midway between the tip of the shoulder (acromion process) and the inferior posterior aspect of the humerus (olecranon process) with the skinfold parallel to the longitudinal axis of the upper arm. The site was located with the elbow flexed at 90 degrees but the reading was taken with the arm hanging, in a relaxed manner, by the side (figure 3.8).

Subscapula.

This skinfold measurement was taken at a point one centimetre below the inferior angle of the scapula in the diagonal plane, at approximately 45 degrees from the vertical and horizontal planes. The subject was standing in a relaxed position (figure 3.9).

Supra-iliac.

The supra-iliac measurement was taken from a point fractionally medial to the anterior superior iliac spine. The subject was standing in a relaxed position (figure 3.10).

The CAHPER Fitness-Performance II Test.

The first CAHPER Fitness-Performance Test was established in 1963 because of a recognition of the need for normative information on measures of physical fitness of Canadian children and youth. 'A test battery was developed that could easily be administered in the school by teachers not necessarily trained in fitness-performance measurements.' (CAHPER, 1980)

The initial test battery was administered to 11000 subjects, aged 7-17 years, throughout Canada with percentile norms developed from the data. The test battery was extensively used until 1979 when test items were revised, and using 9000 subjects aged 6-17 years throughout Canada the revised norms for the Fitness-Performance II Test were established. The revised test used items measured in metric units rather than imperial. The only radical change in test items was the increased distance in the endurance run from 300 metres to 1600 metres (10-12 year olds). Research had shown that 'a longer run better estimates endurance fitness.' (CAHPER, 1980) All test descriptions have been taken from the CAHPER Fitness-Performance II Manual (1980).

The Fitness-Performance II Test consists of the following items:

The Anthropometric Measures;

The Flexed Arm Hang;

The Shuttle Run;

The One Minute Speed Sit-ups;

The Standing Long Jump;

The 50 Metre Run;

The Endurance Run.

The Anthropometric Measures

The measures of height and weight were taken for three reasons; a) to assess the relationship between these variables and other measures; b) to monitor the changes over the period of the study; c) to compare the data from the research sample with other groups.

Height.

Height was measured using the Avery height/weight scales which consist of a vertical two-metre stick (in 50 millimetre graduations), with a horizontal sliding caliper which was lowered on to the highest point of the pupil's head. The pupil stood erect, without shoes. The pupil faced the vertical measuring instrument and looked straight ahead. The reading was recorded to the nearest centimetre.

Weight.

Weight was measured using the Avery height/weight scales which are calibrated every three months by Regional inspectors and re-set when necessary. The scale is graded in grammes and kilogrammes. The pupil stood in shorts, shirt and stockings. The reading was recorded to the nearest 0.01 kilogrammes.

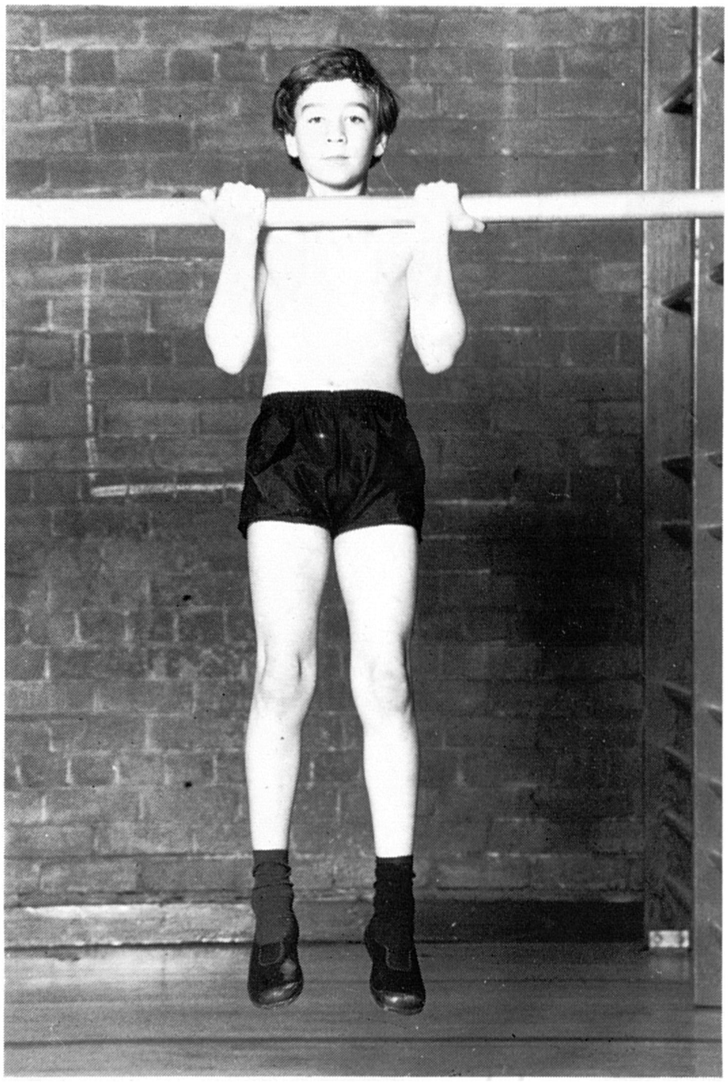


Figure 3.11 Flexed Arm Hang

The Flexed Arm Hang (figure 3.11).

The Flexed Arm Hang is a measurement of isometric muscular endurance of the arms.

A horizontal aluminium bar 15 centimetres in circumference and 2 metres from the floor was used throughout the testing.

The pupil took a reverse grip (palms towards face) on the bar and was assisted into position at the bar so that his/her chin was level with the bar. The chin was not allowed to rest on the bar. The hands were shoulder width apart with arms fully bent. The tester stopped any swinging motion of the pupil.

The total time that the pupil could maintain the correct position was recorded to 0.1 seconds. When the pupil's head level dropped and the eye level was below the bar, the trial was terminated. The pupil remained on the bar as long as possible.

For safety purposes a gymnastic mat was placed below the bar and the tester stood near the pupil throughout the test. Moisture was removed from the bar after each trial and each pupil was encouraged to dry his/her hands on a towel before assuming the start position.

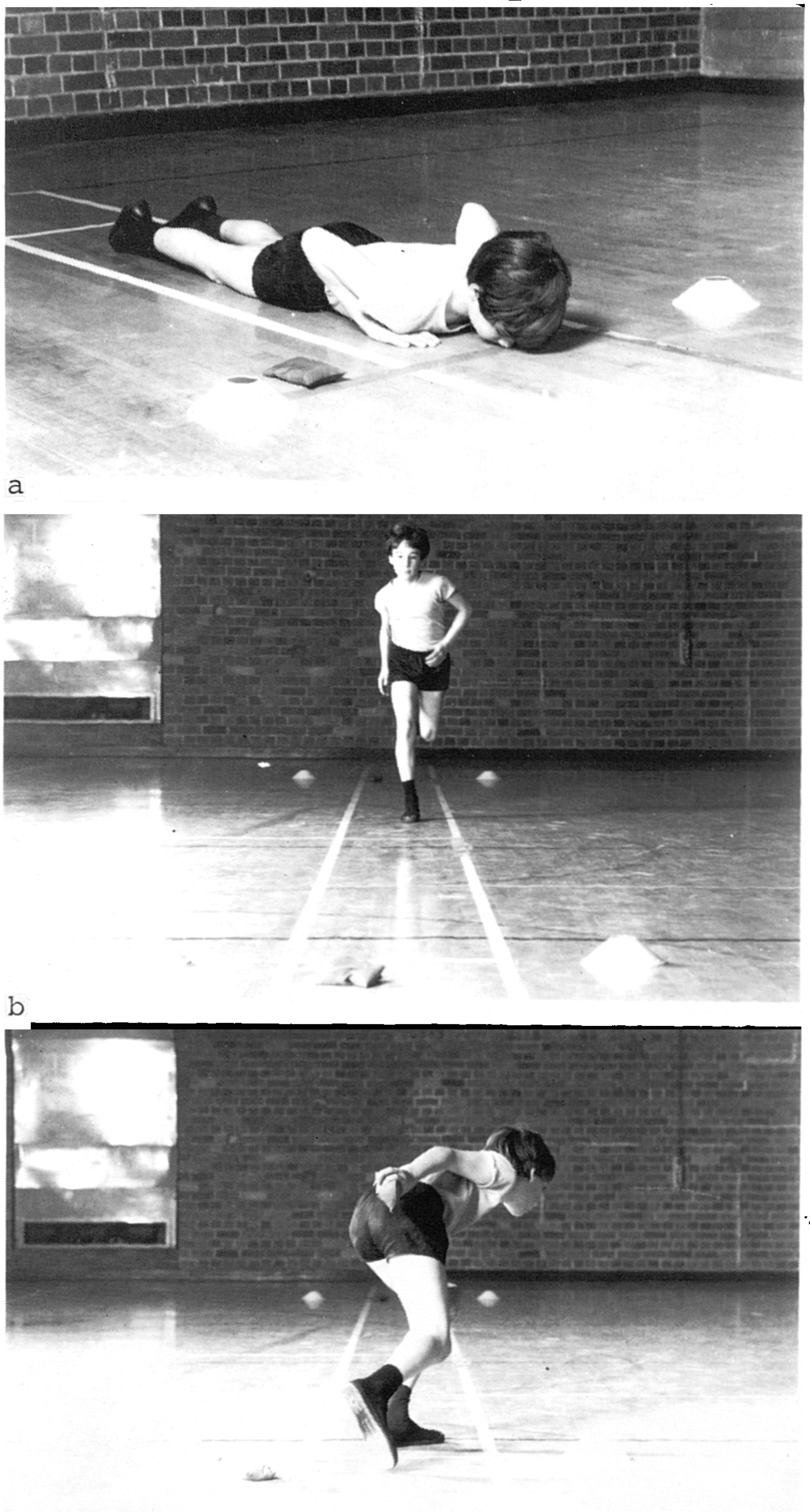


Figure 3.12 Shuttle Run

The Shuttle Run.

The Shuttle Run measures speed and agility (direction change).

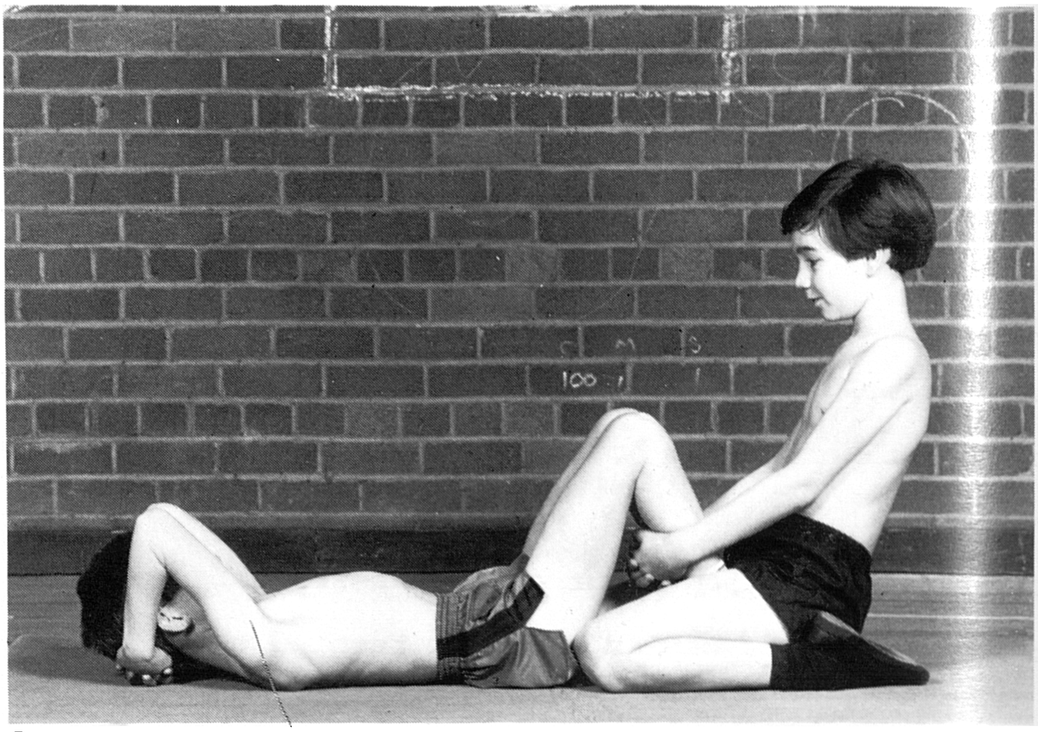
The Manual recommends 3 wooden blocks as part of the necessary equipment but in this study 3 bean bags were used. This alternative is sanctioned by CAHPER and by 'Fitness and Amateur Sport Canada' (CAHPER, 1982).

One beanbag was placed alongside the pupil who was lying face down, hands at the side of the chest and the forehead on the starting line (figure 3.12a). Two beanbags were placed on the line 10 metres away.

On the command to start, the pupil rose to his/her feet and ran 10 metres to the line (figure 3.12b), collected a beanbag and returned to the 'start' line. The pupil placed the beanbag he/she was carrying across the line, picked up another beanbag and returned to the 10 metre line (figure 3.12c), deposited the second beanbag over the line, collected the last beanbag and sprinted back to the 'start' line. The pupil was timed from the command to start until he/she crossed the 'start' line having completed the tasks set out above. Time was measured to 0.1 seconds.

All computations have been carried out with the scores adjusted to units of metres per second (m/s); i.e. the higher the score the better the performance.

The test was taken in training shoes or barefeet. The pupil was given a 'ready' warning before the command 'start'. Two trials with sufficient rest between each were allowed and the better time was recorded.



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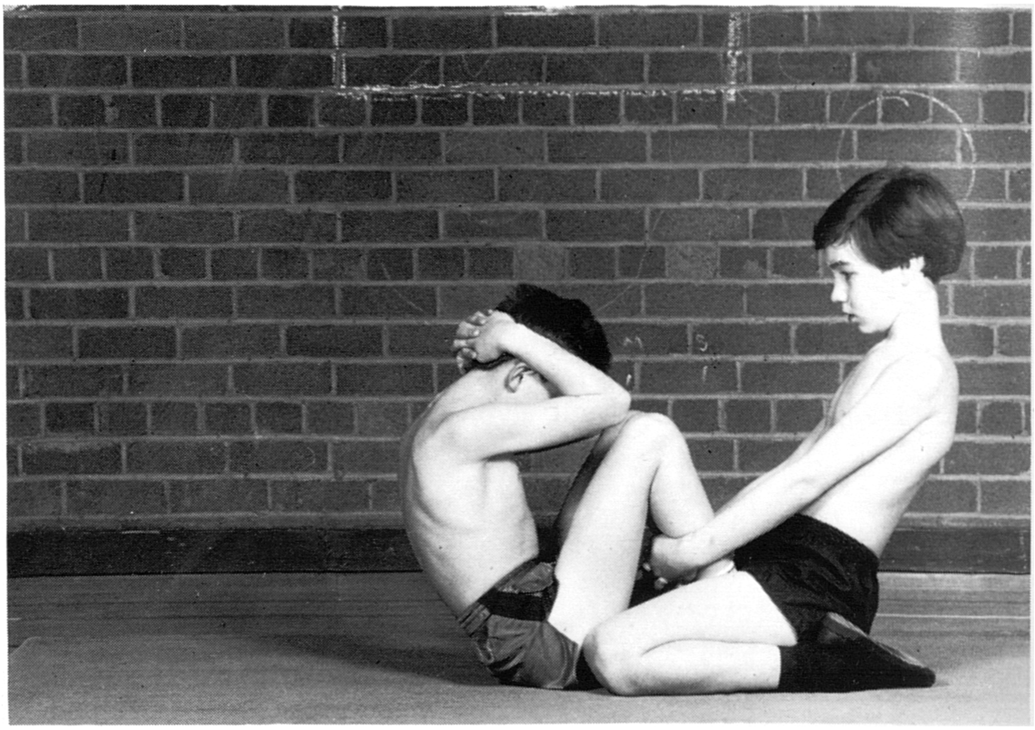

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Figure 3.13 Sit ups

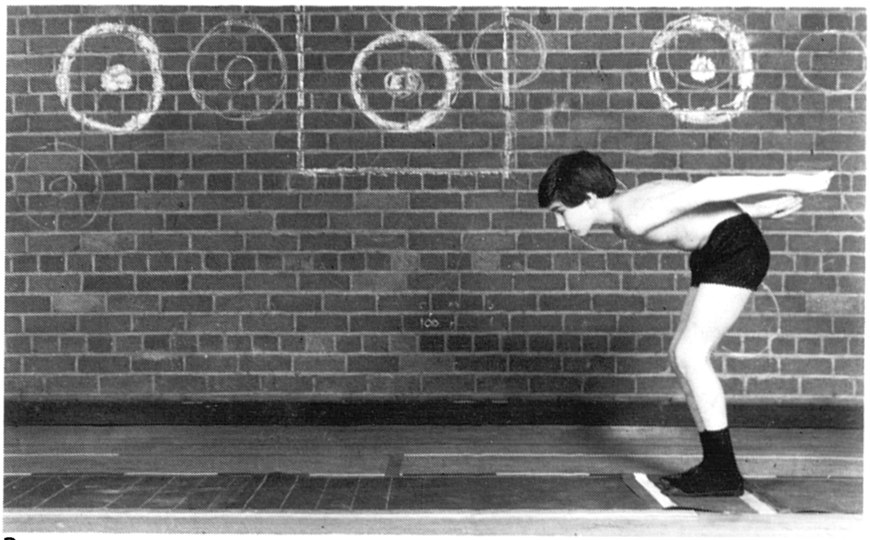
The One Minute Speed Sit-ups.

One Minute Speed Sit-ups measure isotonic muscular endurance of the abdominal muscles.

The pupil adopted a back-lying position on a mat, fingers interlocked behind his/her head (figure 3.13a). The knees were bent at an angle of approximately 60 degrees and the feet were held flat on the floor by a partner. The pupil sat up and touched both elbows to his/her own knees (figure 3.13b). He/she then returned to the starting position so that the hands behind the neck touched the mat.

The partner sat on the pupil's feet with his/her legs spread to each side of the subject. He/she placed his/her hands on the calves of the subject's legs, just below the back of the knee, to prevent the pupil from sliding and to maintain the starting position of the legs throughout the test. The pupil's buttocks remained on the floor at all times (no rocking). The sit-ups did not need to be performed continuously.

The score was the number of complete executions performed in 60 seconds. The count was taken when the elbows touched the knees. One trial was allowed.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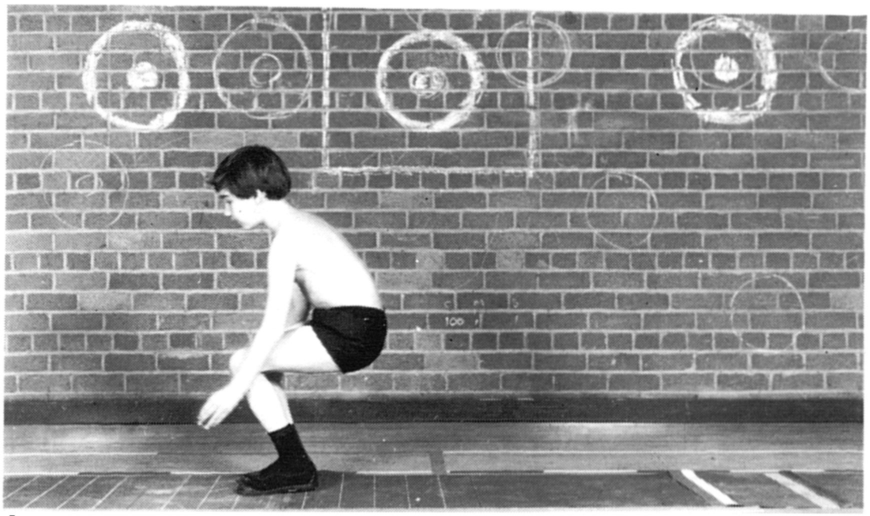
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Figure 3.14 Standing Long Jump

The Standing Long Jump.

The Standing Long Jump has been accepted as a valid measure of explosive muscle power of the leg extensor muscles. The test was conducted on a thin rubber mat which rested on a wooden gymnasium floor. The children wore training shoes. A line drawn on the mat was used as the take-off mark and marked 0 centimetres. There were lines drawn across the mat at 1 centimetre intervals.

The pupil assumed a position with feet shoulder width apart and toes behind the take-off line (figure 3.14a). The hips, knees and ankles were bent sufficiently to allow the pupil to thrust vigorously with his/her legs, and swing with his/her arms (figure 3.14b) and to jump as far as possible along the mat (figure 3.14c). Measurement was in centimetres, from the take-off line to the heel of the foot which landed nearest to the take-off line.

Three valid trials were allowed and the best score recorded. The pupil was informed of each trial score. If any part of the body touched behind the heels on landing, the jump was considered invalid. To avoid fatigue from consecutive jumps, rotation through a group of 5 or 6 subjects was used.

The 50 Metre Run.

The 50 Metre Run is a measure of general total body speed and a valid measure of anaerobic working capacity.

A straight of 50 metres, with markers at the start, finish and 5 metres beyond the finish, was constructed. The pupil stood behind the start line looking towards the finish. The timer stood at the finish line with arm raised as a 'ready' signal to the pupil. On dropping the arm the timer activated the watch and the pupil sprinted towards the finish line. The elapsed time, from the starting signal to the passing of the runner's chest across the finish line, was recorded to 0.1 seconds.

All computations have been carried out with the scores adjusted to units of metres per second (m/s); i.e. the higher the score the better the performance.

The test was conducted on a flat tarmac playground surface. The test was postponed if the wind speed was considered likely to influence the scores. All pupils wore training shoes. The pupil was advised to sprint to the marker beyond the finish and was timed over two trials with the faster time recorded. To avoid fatigue rotation through a group of 5 or 6 pupils, between runs, was used.

The Endurance Run.

The Endurance Run in the CAHPER Fitness-Performance II Test is 1600 metres for children aged 10-12 years. The purpose of this run is to measure maximal functional capacity and endurance of the cardio-respiratory system.

A 400 metre oval track was constructed on grass using cones as markers at the bends and at regular intervals around the track. A minimum of 8 and a maximum of 15 pupils ran at the same time. The pupils were informed of the required number of laps (4) to be completed in as short a time as possible. On the start signal the pupils ran/walked the required number of laps.

The elapsed time, from the starting signal until the pupil's chest crossed the finish line, was recorded to the nearest second.

All computations have been carried out with the scores adjusted to units of metres per second (m/s); i.e. the higher the score the better the performance.

The children were allowed to walk, stop or rest if necessary. The most efficient method of scoring had the administrator reading off the time of each pupil, as they crossed the line, into a Philips 0185 dictating machine. A second 'official' gave the pupils 'place cards' with their position marked on the card. At the conclusion of the run the times were recorded alongside the pupil's name which had been placed on a list in the order of finish. All groups used an identical track.

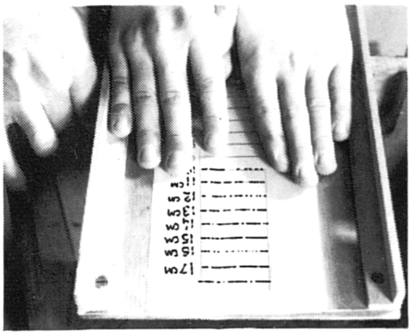


Figure 3.15 Sit and Reach

Sit and Reach Test (figure 3.15).

One test of flexibility was used, 'Sit and Reach' (Wells and Dillon, 1952). This test measures the flexibility of back and leg around the hip joint.

The equipment for the test consisted of a sit and reach box (Wells and Dillon, 1952) which had a platform scale sitting on top of a cross board. The scale was marked at one centimetre intervals. When the pupil sat on the floor his/her feet rested against the cross beam, and the platform was adjusted to rest gently on top of the subject's toes. A score of 16 centimetres corresponded to a vertical plane through the soles of the feet. A score greater/less than 16 centimetres indicated that the pupil could/could not reach beyond the soles of his/her feet.

The pupil extended his/her arms forward with hands facing down on the platform scale; stretched as far as possible; remained in the stretch position for three seconds. The administrator held down the pupil's knees during the test and noted the extent to which the fingertips of both hands had reached. The reading was taken to the nearest centimetre. If the hands reached unevenly, the hand reaching the shorter distance determined the score. Each pupil was given three trials and the best score was recorded.

Basic Motor Control Tests.

In order to examine the factors which contribute to basic motor control a battery of tests was devised for this study. The battery consisted of a test of balance, two tests of hand-eye co-ordination (throwing a ball at a target; catching), a test of foot-eye co-ordination (kicking a ball at a target) and a test of reaction.

The following tests were unsuccessful in terms of reliability and validity. The test of balance, using a stabilometer, required considerable practice by the subjects and became impractical for the large sample. The test of hand-eye co-ordination which involved catching a tennis ball, projected by a tennis serving machine, became a test of courage rather than a test of co-ordination. The intended test of foot-eye co-ordination did not discriminate between the pupils. Consequently these three tests could not be used in the final analysis.

The remaining two tests, throwing at a target and the test of reaction, which were valid and reliable, do not constitute a basic motor skills battery and consequently have also been excluded from the main study.

3.3.3 Affective Tests.

Research into the affective changes on children who have been engaged in increased time on physical education has been identified in chapter 2.

In this study the researcher wished to investigate the effects of the project on the child's attitude to self, peers, parents, teachers, school and the importance of doing well. Finally the teacher's view of the child was important and this was included.

The test battery, in this domain, consisted of well established questionnaires which met the needs of the study. These were:

A Children's Behaviour Questionnaire;
School Questionnaire - S7 (Primary Children's Attitude Questionnaire).

Two additional questionnaires were administered to the 'Daily P.E.' pupils in the Pilot Study: A Physical Education Attitude Scale for the Intermediate Level in Elementary Schools (Martens, 1979b) and the Children's Personality Questionnaire (Porter and Cattell, 1979). The Physical Education Attitude Scale was modified for use with Scottish children but the results were dropped from the analysis because it did not seem to be valuable as a discriminative instrument. The Children's Personality Questionnaire was not used in the analysis since the central focus of the research was concerned with pupil progress and a substantial amount of data had already been collected on the achievement of the pupils.

A Children's Behaviour Questionnaire.

The Children's Behaviour Questionnaire (Rutter, 1967) consists of 26 items which describe pupil behaviour in the school situation. The questionnaire was completed by the teacher who reported on a three point scale to each item. By summing the 26 items a total score was produced with a range from 0 to 52.

'Neurotic' and 'anti-social' sub-scores were obtained by summing selected items within the questionnaire.

'The selection of children with neurotic or anti-social disorders by means of the scale is a two-stage procedure: 1) children with a total score of 9 or more are designated as showing some disorder; 2) of these children, those with a neurotic score exceeding the anti-social score are designated 'neurotic', and those with an anti-social score exceeding the neurotic score are designated 'anti-social'. The children with equal neurotic and anti-social subscores remain undifferentiated.' (Rutter, 1967)

The scale is short and easy to use but it has its limitations and requires to be supplemented by additional information from the teacher.

School Questionnaire - S.7 (Primary Children's Attitude Questionnaire).

The School Questionnaire- S7 was selected because it is a simply administered group questionnaire which measures and describes important attitudinal differences between groups of children in primary school.

The questionnaire was constructed for use by pupils aged from 9 to 11 years. 'The principle in the construction of the scales was to obtain the items from statements actually made by children for whom the scales were intended.' (Barker-Lunn, 1969)

The ten attitude scales are:

A - Attitude to school;

B - Interest in school work;

C - Importance of doing well;

D - Attitude to class;

E - 'Other' image of class;

F - Conforming versus non-comforming pupil;

G - Relationship with teacher;

H - Anxiety (non-anxious versus anxious) about schoolwork;

I - Social adjustment;

J - Self image.

Barker-Lunn draws attention to the fact that the scales fall into two neat clusters. 'The first seven scales (A-G) deal with attitudes towards aspects of school work, and the other four (G-J) are more concerned with social relations and the personality of the pupil.' (Barker-Lunn, 1969) 'Relationship with teacher' (scale G) appears in both clusters.

3.3.4 Significant Others.

Children.

The children in the two classes from School A kept individual daily diaries (appendix C) throughout the Pilot Study. They recorded the form of travel which they took to school each day, their rising and retiring times, their diet and their leisure pursuits. The diaries were retained for analysis. The children in the 'Daily P.E.' class discussed individually, with their class teacher, their feelings about the year in the programme.

Parents.

In the Pilot Study, the researcher, head teacher and class teachers of the 'Daily P.E.' class and the 'Normal P.E.' class, met with the parents/guardians of the children in the 'Daily P.E.' class (referred to throughout as parents) and fully informed them of the aims and background to the programme. They were assured that the allocation and organisation of time would not disadvantage the children in other areas of the curriculum. It was emphasised, to the parents, that the decision to engage the children in a daily physical education programme was made on educational grounds and that the aim of the programme was to positively influence the health of the child. Throughout the programme the parents were kept informed of developments. At the annual parent's day meeting, on completion of the Pilot Study programme, the researcher met with the parents of children in each of the classes. At this meeting the parents of the 'Daily P.E.' children were given a progress report of their child in the programme. The parents of the 'Normal P.E.' children were given the opportunity to discuss the programme with the researcher. All parents were fully informed about the study.

At the end of the Pilot Study programme a questionnaire was sent to all parents of the 'Daily P.E.' class. The questionnaire, completed by the parent(s), contained set choice questions with opportunities for comment. The questionnaire (appendix D) was delivered to, and collected from, the parents by the children.

Professionals.

The class teacher, of the daily physical education class, evaluated her year and was interviewed by an independent evaluator (appendix B). The head teacher, school psychologist and adviser in physical education all reported on the Pilot Study from their own perspectives (appendix E). The researcher kept a record of the aims, content and evaluation of each lesson taught and a daily diary throughout the Pilot Study year.

3.3.5 Attendance.

Attendance at school for the year 1980-1981 was compared with year 1981-1982 to determine any changes in the pattern of absences between classes and children immediately before and during the Pilot Study year.

TESTS	Pre-	Post-
Flexibility Test	August	June
CAHPER Fitness-Performance II Test	August	June
Staffordshire Test (Computation)	June	June
Gapadol Test (Reading Comprehension)	June	June
School Questionnaire (S7)	August	June

Figure 3.16 Linwood Project Test Calendar.

3.4 Test Battery - The Linwood Project.

In one year the study expanded from one school (Pilot Study) to seven schools (figures 3.2, 3.3). The objectives of the Pilot Study were evaluated (chapter 4) and objectives were designed for the expanded project. Although the objectives did not change it was necessary to re-examine the test battery which would focus on key issues identified by the researcher. The test battery was trimmed and those instruments which would produce reliable and valid information, relating to motor ability, academic performance and attitude to school, were retained.

The skinfold measurements were omitted from the Linwood Project because of the increase in sample size, the unavailability of experienced testers and the time involved in measuring pupils. The Basic Motor Control Tests, Physical Education Attitude Scale, CPQ, Children's Behaviour Questionnaire were also removed from the test battery. The Parents Questionnaire was modified and used in the first year of the expanding project (appendix D). However the timing and procedure of the remaining tests were consistent for the Pilot Study and the Linwood Project (figure 3.16).

In the 'Linwood Project' it was left to the five primary school head teachers to inform parents about the programme. The researcher was called in if the head teacher felt that additional information or assistance in this matter was necessary. Throughout the Linwood Project, the researcher was available for consultation by parents, teachers, head teachers and any other interested parties.

The identification of each child, class, class teacher, school and test score (pre- and post-programme) for the Pilot Study and the Linwood Project was stored in an IBM 4331 computer. Each piece of information was readily available and the Statistical Package for the Social Sciences (SPSSX) was used for analysis of the data.

3.5 The Programme.

Physical Education must play its part in the development of the fully functioning person. This it must do through physical, emotional, social and intellectual development. These factors contribute to the child's development and are essential to the design of a 'balanced' physical education programme. This is the inter-relationship and co-ordination of the different objectives within each domain (physical, affective and intellectual). The balance in and across the domains, the commitment and level of expertise of the teacher(s), and the frequency and intensity of activity by the children, are what determine a 'quality physical education programme' (figures 3.17, 3.18).

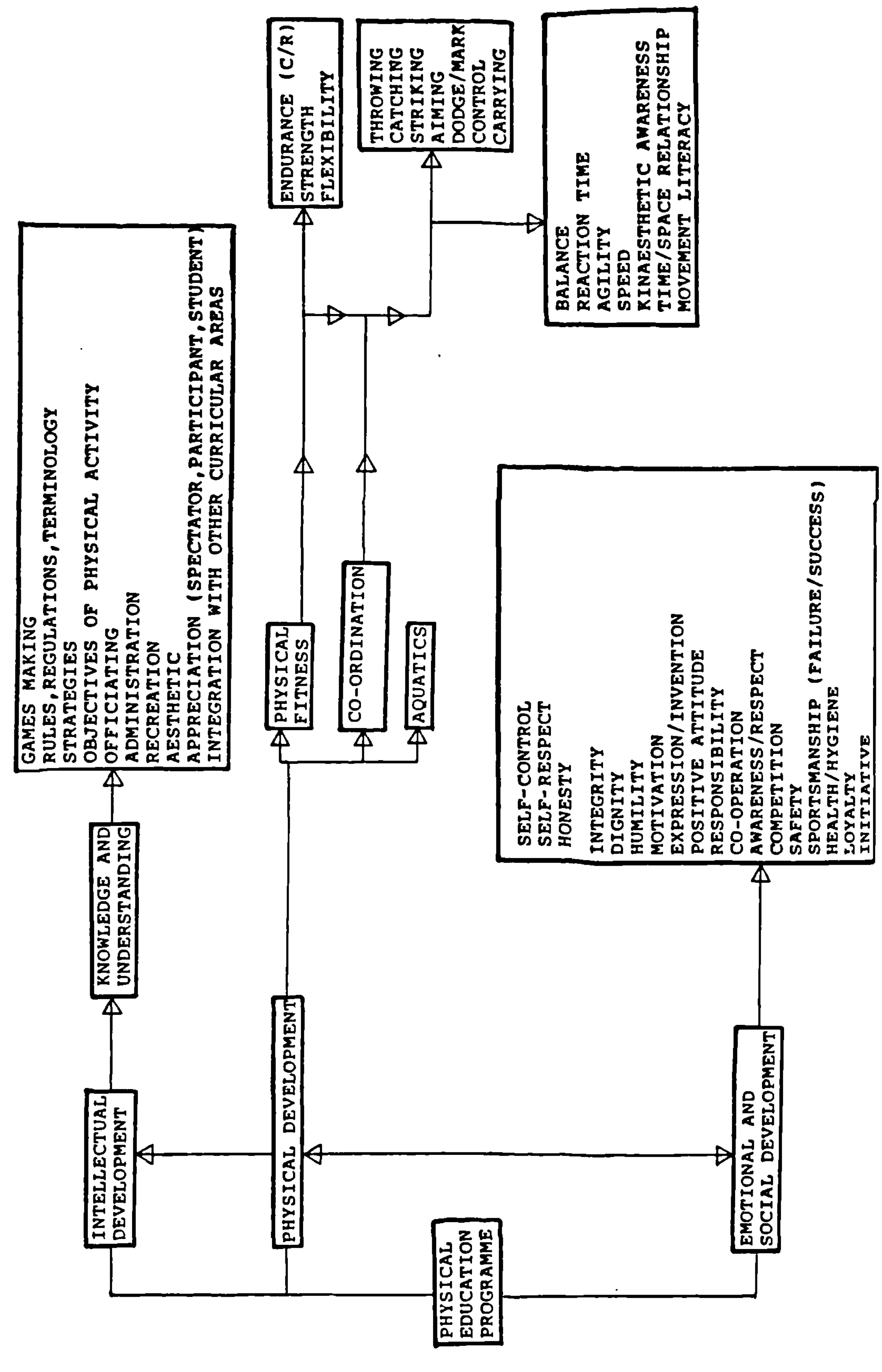


Figure 3.17 Inter-related Nature of Developmental Domains through Physical Education.

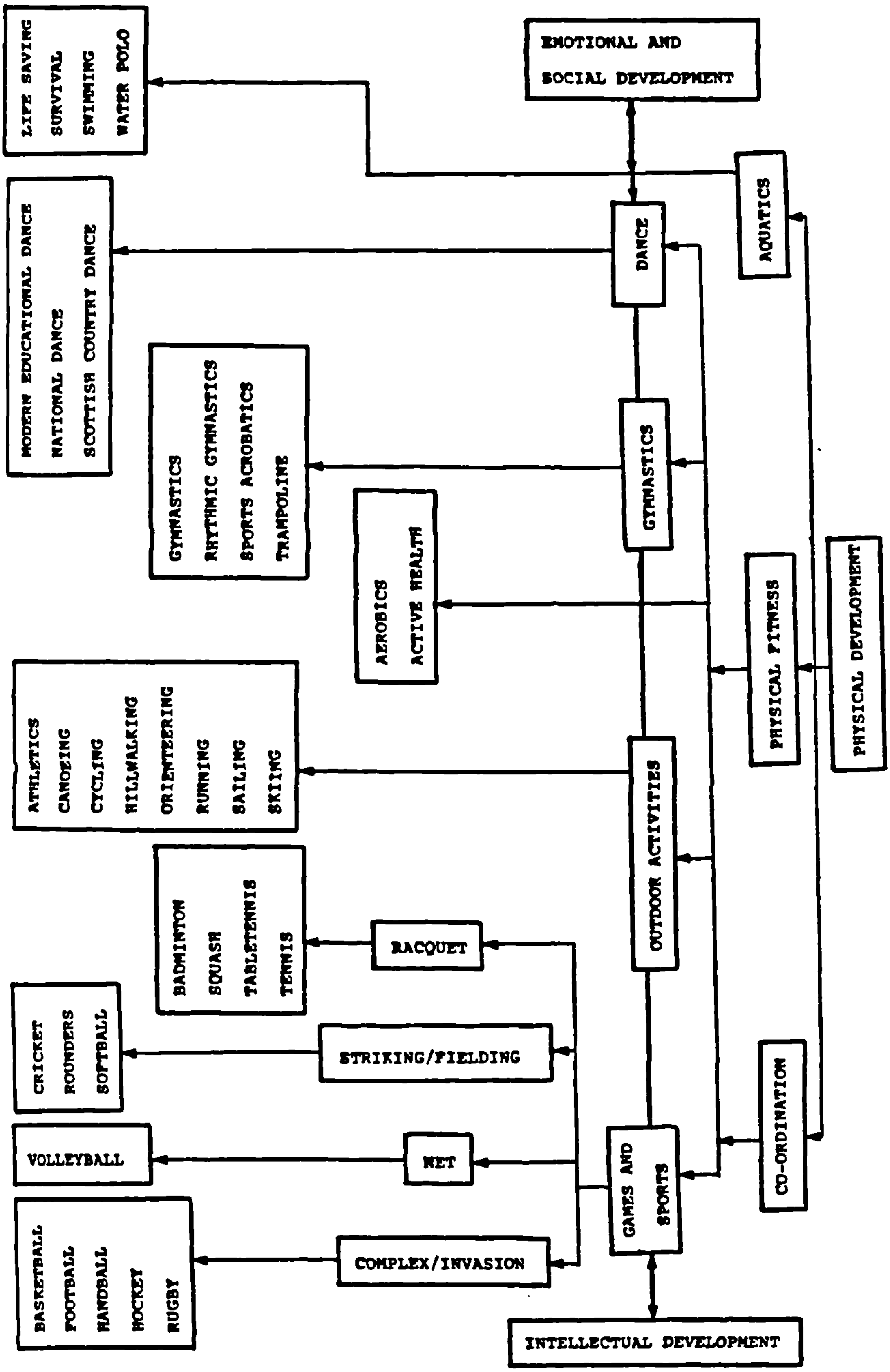


Figure 3.18 Curricular Physical Education.

DAY	TERM 1	TERM 2	TERM 3
Monday	Gymnastics	Dance Orienteering	Games Festivals
Tuesday	Swimming	Games	Games Festivals
Wednesday	Games	Games Athletics	Athletics Festivals
Thursday	Games	Gymnastics Orienteering	Games Festivals
Friday	Swimming Games	Games	Gymnastics Festivals

Figure 3.19 Pilot Study Timetable.

Type	Activity	Number of sessions
Gymnastics		20
Swimming		15
Dance	Creative Dance	6
	Scottish Country	5
Team Games	Basketball type	14
	Hockey type	12
	Volleyball type	14
	Football type	10
Individual Games	Badminton type	10
	Tabletennis type	6
	Squash type	7*
	Tennis type	7*
Outdoor Activities	Orienteering	8
	Athletics	8
Other	Trampoline	7*
	Multi-sports	10
	Festivals	10

Figure 3.20 Pilot Study Programme.

(* 3 activity groups per lesson of 60 minutes)

3.5.1 Pilot Study.

The Pilot Study, daily physical education programme (figure 3.19), started on 22nd September 1981 with the 'Daily P.E.' group engaging in a daily lesson of physical education for the session 1981-1982. The programme was conducted with a time allocation of between 45 minutes to 60 minutes per day in most activities, but as much as a half day on some which were time-consuming by nature (e.g. orienteering). The allocation of time was similar to many research programmes in Canada, Australia and the United States of America (figure 3.20). The 'Daily P.E.' group was taught jointly by a physical education specialist and class teacher 1. As the session progressed the roles of the two teachers evolved, from the class teacher initially assisting the specialist, to eventual co-operative teaching. It was considered important: that the class teacher would become more proficient in the teaching of physical education; that the primary school ethos was preserved by the class teacher's presence; that the learning opportunities which linked the physical education programme and the classroom curriculum were maximised. The 'Normal P.E.' group was taught physical education by their class teacher (teacher 2).

3.5.2 Linwood Project.

In 1982-1983, the expanded programme in school A was similar to that taught in the Pilot Study. However the timing of classes and content of the programme were now the responsibility of the primary school teachers, head teacher and principal teacher of physical education in the associated secondary school. The researcher acted as adviser to the various parties and co-ordinated the programme. The programme was taught jointly by the primary class teachers and the physical education staff from the associated secondary school.

In the initial stages of the programme the class teachers were encouraged to observe the specialists teaching. Time was reserved for discussion between the two teachers before and after each lesson. As the programme developed the class teacher was encouraged to become more actively involved in the lessons by assisting in group work or taking part(s) of the lesson. Eventually involvement by the class teacher increased, until there was a fully co-operative teaching approach by specialist and class teacher. Some class teachers had sufficient expertise and confidence in certain areas of the physical education curriculum to engage in co-operative teaching with the specialist from the outset. All

DAY	TERM 1	TERM 2	TERM 3
Monday	Active Health	Dance Athletics	Athletics Festivals
Tuesday	Dance	Games	Orienteering Festivals
Wednesday	Gymnastics	Swim	Games Festivals
Thursday	Games	Gymnastics Festivals	Orienteering Festivals
Friday	Games	Games	Games Festivals

Figure 3.21 Linwood Project Specimen Timetable

Activity	Number of sessions
Active Health	16
Creative Dance	18
Scottish Country Dance	7
Gymnastics	24
Games	70
Athletics	5
Orienteering	10
Swimming	14
Festivals	16

Figure 3.22 Linwood Project Specimen Programme
(40 minute sessions)

teachers have stressed the importance of the Divisional Guidelines in Physical Education. These guidelines were written by specialists and class teachers as part of the research programme in physical education operating within the division. The packages were comprehensive and were supplied to every school in Renfrew Division.

The specialists were encouraged to engage in classroom related work with the class teacher when appropriate and to be aware of the stages at which the classroom topics linked with the physical activity. This co-operative approach followed the philosophy of the Physical Education Primary-Secondary Integration scheme.

The initial planning of the daily physical education programme in 1983-1984 involved co-operation between the two principal teachers of physical education in the two Linwood secondary schools and the project co-ordinator (figure 3.21). The co-ordinator then consulted with the teachers in the respective schools. The two programmes varied slightly due to differences in staffing strength and availability in the two secondary school physical education departments (figure 3.22). However the objectives of the project were common to each programme and were those of the Pilot Study.

The co-ordinator's role was to provide support for the teachers; to co-operate with the staff in timetable arrangements; to ensure that an adequate supply of necessary equipment was available; to be a source of information on curricular materials and new developments; to assist in interpreting the programme and new curricular areas; to assist the school in resolving problems encountered in the project; to liaise with schools, class teachers, specialists, advisory service and other agencies; to frequently visit the different agencies; and to ensure that the overall philosophy of the Linwood Project was maintained. The schools receiving 'Normal P.E.' (B in 1982-83; F and G in 1983-1984) received one period from their class teacher and one period from a visiting physical education specialist each week.

Chapter 4.

Pilot Study - Analysis of Results.

Only the scores of the children who had a score on the pre-test and post-test for EACH item were considered. If either of these scores was missing then the child was not included in the analysis of that item. Having two scores for each child on each item, a new variable was created, a 'change' score. Since an improvement was an increase in score, the pre-test score was subtracted from the post-test score and the new variable was created. Consequently, in this study, an improvement 'change' is always a positive score.

Throughout the analysis of the Pilot Study it was necessary to exert caution in the interpretation of results. It should be noted that the sample was small, less than twenty five in each group with both groups coming from the same school (school A), and from the same stage (primary 6). The author is aware of the possibility of Type 1 errors arising due to sample size and hence the importance of regarding the Pilot Study as an exploratory project, most of the results of which will be open to further scrutiny in the later investigations. At the same time the close proximity of the two groups could have been responsible for Hawthorne effects which could have diminished the observable influences of the daily physical education programme. These two factors have to be kept in mind when inspecting the results of the Pilot Study, but hopefully will be less problematic in the expanded research.

	Shuttle Run			St. Long Jump			Sit-ups		
	♂	♀	Both	♂	♀	Both	♂	♀	Both
'Daily P.E.'	-0.04	0.03	0.00	-0.02	0.09	0.04	6.4	11.7	9.2
'Normal P.E.'	-0.04	0.05	0.00	-0.01	0.02	0.01	1.9	6.1	3.7
N = 'DPE'	10	11	21	10	11	21	10	11	21
N = 'Normal'	12	10	22	13	10	23	13	10	23

	Flex. Arm Hang			50 Metre Run			Endurance Run		
	♂	♀	Both	♂	♀	Both	♂	♀	Both
'Daily P.E.'	5.5	7.6	6.5	0.50	0.54	0.52	0.31	0.35	0.33
'Normal P.E.'	-3.4	-1.1	-2.4	0.35	0.59	0.46	0.26	0.09	0.23
N = 'DPE'	10	10	20	9	11	20	9	10	19
N = 'Normal'	12	10	22	12	10	22	12	10	22

Table 4.1 Group Mean 'Change' scores - CAHPER Fitness Battery.

4.1 Motor Fitness Analysis.

CAHPER Fitness-Performance II Test.

Using a two-way analysis of variance on each of the six items in the 'CAHPER' test battery, no differences existed, at the 0.05 level of significance, between the two treatments ('Daily P.E.' and 'Normal P.E.'), between the sexes, or group by sex interaction.

On inspection for trends (table 4.1), it can be seen that the 'Daily P.E.' girls had improved on all six items and had shown greater improvement than the 'Normal P.E.' girls on four out of the six items (excluding shuttle run and 50 metre run), over the year. The boys in the 'Daily P.E.' group had improved on four items of the battery but had regressed on two (shuttle run and standing long jump). The boys in the 'Normal P.E.' group regressed on three items (shuttle run, standing long jump and flexed arm hang). However the boys in the 'Daily P.E.' group had shown a greater 'change' score on every item, except shuttle run and standing long jump, than the boys in the 'Normal P.E.' group. The boys and girls of the 'Daily P.E.' group improved their score on the flexed arm hang, while both sexes, boys and girls, in the 'Normal P.E.' group had regressed.

Since 'change' scores do not indicate the starting points from which the different groups had emerged, it was necessary to examine the absolute scores. A two-tailed t-test was used on the absolute mean scores from pre- and post-programme testing to determine whether or not there were significant differences between the 'Daily P.E.' boys and the 'Normal P.E.' boys and between the 'Daily P.E.' girls and the 'Normal P.E.' girls.

Where the F-value was not statistically significant at the 0.05 level it has been assumed that the variances of the sampled populations were homogeneous and Pooled Variance Estimate has been used. Where the F-value has been significant at the 0.05 level then it has been assumed that the assumption of homogeneity of variance has been violated and Separate Variance Estimate has been used. Throughout this study, where Separate Variance Estimate has been used, the code ✠ has been placed in the appropriate table.

However no differences existed at the 0.05 level of significance using the t-test on any of the items in the CAHPER Fitness-Performance II Test in the Pilot Study.

Since this small Pilot Study was being used to give indications for future research an examination

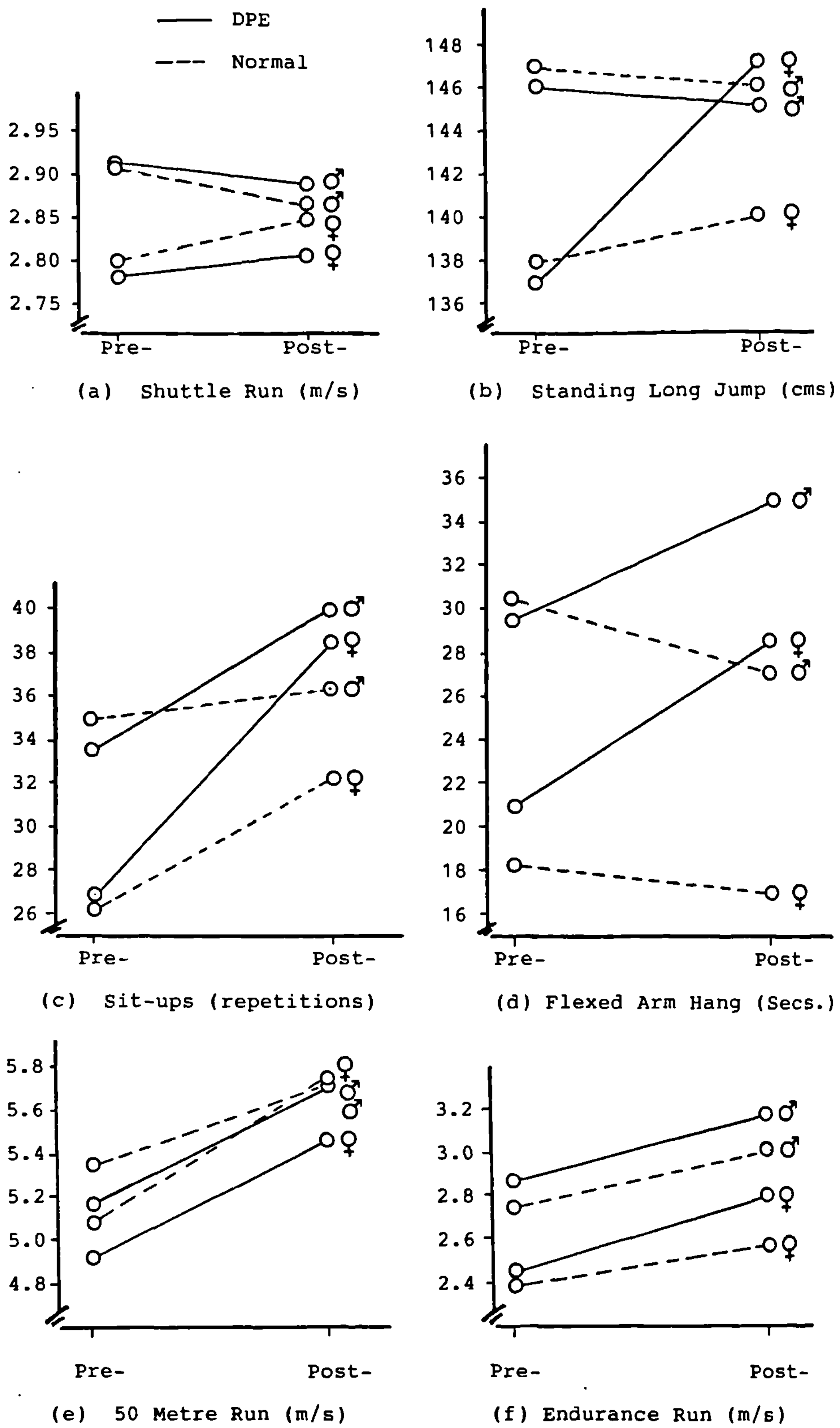


Figure 4.1 CAHPER Fitness-Performance II Mean Scores.

of trends was considered important. Figures 4.1(a-f) illustrate the trends of the two groups by locating the pre-programme scores for each sex, in each group, and comparing that with the post-programme mean score on the same item. This is highlighted by comparing the regression of the 'Normal P.E.' girls on flexed arm hang against the superior pre- and post-programme scores of the 'Daily P.E.' girls.

Several issues arise from the results. Since both groups of boys had regressed in shuttle run performance does this indicate that boys, at this stage, have difficulty in manoeuvering their bodies? Since both groups of girls improved on this item why was there a difference in performance between the sexes? The pattern was repeated, regression by the boys and improvement by the girls, in standing long jump. These should be investigated in a larger sample.

The other results: standing long jump (girls), sit ups (boys and girls), flexed arm hang (boys and girls), 50 metre run (boys) and endurance run (boys and girls), suggest that the children who engaged in the daily physical education programme in the Pilot Study had benefited, in terms of the CAHPER Fitness-Performance II battery, as measured alongside the children who experienced 'normal' physical education provision.

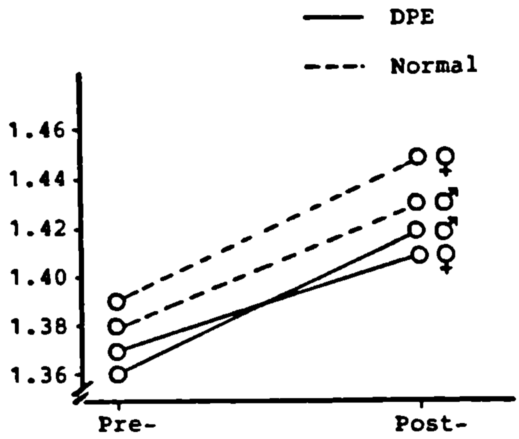


Figure 4.2 Mean Heights (m)

Anthropometric Analysis.

The anthropometric measurements consisted of standing height and weight. As in the CAHPER Physical-Performance II battery, a child was only included in the anthropometric analysis if there was a pre-programme and post-programme measurement.

Height.

The heights of the children were compared in two ways. From examination of figure 4.2 it can be seen that the two groups had not differed in mean height increase. It would appear that the 'Daily P.E.' boys and 'Normal P.E.' girls had shown the same increase and that the 'Daily P.E.' girls had grown the least of the four categories. Although girls are normally taller than boys (approximately by 2 centimetres at 11 years), the 'Daily P.E.' girls were surprisingly not. The size of this sample is the most likely explanation and it is not intended to draw any other conclusions from these figures. However from the National Study of Health and Growth (NSHG) figures in 1972 (Rona and Altman, 1977) the 'Daily P.E.' girls were situated above the 50th centile for Scottish children in that survey. The children in the 'Normal P.E.' group and the boys of the 'Daily P.E.' group were between the 50th and 75th centiles and consequently quite tall as a group. It must be

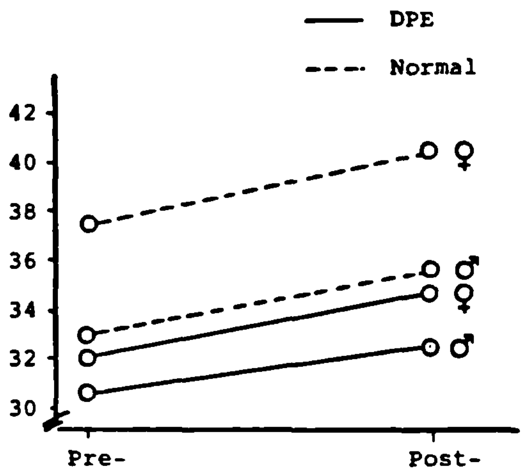


Figure 4.3 Mean Weights (kgs)

remembered that the figures from the NSHG survey were over ten years old and the survey was not considered large enough to produce reliable standards for Scotland.

Weight.

With the known relationship between height and weight it could be expected that the girls of the 'Normal P.E.' group would be heavier than the other three categories. Figure 4.3 allows a comparison between the weights of the boys and girls in the two groups.

As might have been expected, from the mean heights (figure 4.2) the 'Normal P.E.' girls were the heaviest group, followed by the 'Normal P.E.' boys. The 'Daily P.E.' girls were heavier than the 'Daily P.E.' boys, which is not consistent with the pattern for height. This emphasises the need to look beyond height and weight if investigating body composition and attempting to identify children who are obese.

Boys

	'Daily P.E.'			'Normal P.E.'		
	Pre-	Post-	% Red.	Pre-	Post-	% Red.
Biceps	4.62	4.19	9	5.17	4.98	4
Triceps	10.07	8.76	13	11.14	10.45	6
Sub-scapula	5.59	5.62	-0.5	6.54	6.59	-0.8
Supra-iliac	5.05	4.75	6	5.37	5.19	3
Number		10			12	

Girls

	'Daily P.E.'			'Normal P.E.'		
	Pre-	Post-	% Red.	Pre-	Post-	% Red.
Biceps	6.41	5.46	14.8	7.27	6.16	15.3
Triceps	13.16	11.62	11.7	13.98	13.07	6.5
Sub-scapula	9.51	8.32	12.5	10.28	9.58	6.8
Supra-iliac	8.37	7.39	11.7	9.21	8.27	10.2
Number		11			10	

Table 4.2 Mean skinfold measurements (mm) and percentage reductions.

Body Composition.

It is difficult to establish exact standards for obesity at childhood since the body composition of the child is rapidly changing. The body density of the child cannot be evaluated by adult standards (Boyer and Wilmore, 1977) due to the differences in total body water, density of bone, and the child's higher ratio of total body fat to subcutaneous fat. Using skinfold measurements, a combination of procedures were adopted to establish whether the children on daily physical education had changed in body composition in comparison to the children who had received a 'normal' physical education programme.

Table 4.2 permits the examination of absolute mean scores between the groups using all four skinfold sites.

At all four sites the 'Daily P.E.' boys had lower pre-programme scores and lower post-programme scores than the 'Normal P.E.' boys. Both groups of boys had a lower post- score than pre- score at all sites, except subscapula, where both groups of boys increased slightly. However from table 4.2 it can be seen that, with the exception of sub-scapula, the percentage reduction in skinfold thickness by the 'Daily P.E.' boys was twice that of the 'Normal P.E.' boys.

Boys

	'Daily P.E.'			'Normal P.E.'		
	Pre-	Post-	% Red.	Pre-	Post-	% Red.
Sum 2	15.7	14.4	8	17.7	16.2	8.5
Sum 4	25.4	23.5	7.5	30.0	27.2	9.0
Number		10			12	

Girls

	'Daily P.E.'			'Normal P.E.'		
	Pre-	Post-	% Red.	Pre-	Post-	% Red.
Sum 2	22.7	20.0	11.9	24.3	22.7	6.6
Sum 4	37.5	32.8	12.5	40.6	37.0	8.9
Number		11			10	

Table 4.3 The sum of mean skinfold measurements (mm) and percentage reductions.

In many studies either the sum of triceps and subscapula measurements (sum2), or the sum of the four skinfold measurements (sum4), is used. From the sum of the scores in table 4.3 it can be seen that the 'Daily P.E.' boys had less subcutaneous fat than the 'Normal P.E.' boys before and after the programme. The percentage reductions are similar but it could be argued that the 'Daily P.E.' boys had less fat to lose.

From tables 4.2 and 4.3 the girls on 'Daily P.E.' had lower skinfold scores than the 'Normal P.E.' girls before and after the programme at all four individual skinfold sites and in the two summed scores. Despite being leaner than the 'Normal P.E.' girls at the pre-programme testing, the 'Daily P.E.' girls had greater percentage reductions at triceps, subscapula, suprailiac, and in the two summed measurements (sum2, sum4).

In contrast to the boys, the girls did not gain in skinfold thickness at the subscapula site. However the girls did have greater mean scores than the boys at all sites before and after the programme.

To further compare the skinfold measurements of the two groups, use was made of normative data and percentile categories from the National Children and Youth Fitness Survey (NCYFS) conducted in the United States of America and published in 1985 (Ross, Dotson,

Boys						
Percentile Divisions	Norms		'Daily P.E.'		'Normal P.E.'	
% Descriptions	Pre-	Post-	Pre-	Post-	Pre-	Post-
90+ Exceptionally Lean	<12	<12	30	40	17	25
50+ Desire Level	12-17	12-18	50	50	50	50
50- Below Average	17-24	18-25	10	0	25	8
25- Overweight	>24	>25	10	10	8	17
Percentage			100	100	100	100
Number			10	10	12	12

Girls						
Percentile Divisions	Norms		'Daily P.E.'		'Normal P.E.'	
% Descriptions	Pre-	Post-	Pre-	Post-	Pre-	Post-
90+ Exceptionally Lean	<13	<14	0	9	0	0
50+ Desire Level	13-20	14-21	55	64	50	60
50- Below Average	20-27	21-30	9	9	20	20
25- Overweight	>27	>30	36	18	30	20
Percentage			100	100	100	100
Number			11	11	10	10

Table 4.4 Skinfold measurements group (%) performance on NCYFS norms (sum of triceps and subscapula).

Gilbert and Katz, 1985). Table 4.4 illustrates the percentile divisions of NCYFS and the descriptions of these divisions; the normative scores in each division; and the percentage of children in each group before and after the pilot study programme.

From table 4.4 (sum of triceps and subscapula) it can be seen that before the programme started, 36% of the 'Daily P.E.' girls and 30% of the 'Normal P.E.' girls were overweight. On completion of the year, the 'Daily P.E.' girls had dropped to 18% and the 'Normal P.E.' girls to 20%. One boy was overweight before and after the programme in the 'Daily P.E.' group, and the one overweight boy in the 'Normal P.E.' group before the programme was joined by a second at the post-programme assessment.

There was an increase in movement within each of the categories. While the 'Daily P.E.' group of boys moved towards less fat, over the year, the picture was less clear with the 'Normal P.E.' boys. The trend with the two groups of girls was similar although the 'Daily P.E.' group made a more positive movement towards leanness. It is interesting to note the large percentage of boys in the 'exceptionally lean' category in comparison to girls (>30% boys : 5% girls). It must be noted that these are American norms

Boys

Age	'Daily P.E.'	Scotland '72	England '72
9.75	10.75	8.25	8.75
10.75	8.76	9.00	9.25
Number	10	202	610

Girls

Age	'Daily P.E.'	Scotland '72	England '72
9.75	13.16	11.50	12.00
10.75	11.62	12.25	12.75
Number	11	154	536

Table 4.5 Comparisons between 'Daily P.E.' (Pilot Study), Scotland and England on triceps skinfold (mm).

and caution should be exercised in their interpretation.

From extrapolation of triceps skinfold figures produced in 1972 (Rona and Altman, 1977) it can be seen from table 4.5 that the 50th centile triceps skinfold measurement for the boys and girls in the 'Daily P.E.' Pilot Study group was higher at pre-programme than the boys and girls of the same age in Scotland and England in 1972. However the same measurement one year later, post-programme, showed that the children in the 'Daily P.E.' group had a much reduced measurement than the two other groups in the 1972 study. These results would suggest that the 'Daily P.E.' programme had a positive effect on reducing body fat.

Flexibility.

The test for measuring flexibility used in this study was the 'Sit and Reach' test (Wells and Dillon, 1952). It is well documented that boys and girls normally differ in their range of flexibility with girls, as a general rule, more flexible than boys. Some claim that flexibility increases until early adolescence (Corbin and Noble, 1980). However, the evidence is contradictory. The majority of recent studies indicate that there is a gradual decline in flexibility from ages 6 to 12 (Carre et al., 1980).

During the pre-adolescent and adolescent growth spurt (ages 10-14) the child's legs become proportionally longer in relation to the trunk. However 'length of body parts, including height, does not seem to significantly affect flexibility.' (Corbin and Noble, 1980)

A two-tailed t-test on the absolute mean scores failed to show significant differences ($p<0.05$) between the two groups of boys and between the two groups of girls at the pre- and post-programme testing.

It is interesting that while the boys and girls receiving 'Normal P.E.' regressed in this measurement of flexibility, the children in the 'Daily

	Boys						Girls					
	'Daily P.E.'			'Normal P.E.'			'Daily P.E.'			'Normal P.E.'		
	n	Mean	sd	n	mean	sd	n	mean	sd	n	mean	sd
Pre-	9	20.3	5.1	12	20.5	3.3	11	20.1	4.8	10	22.7	3.7
Post-	9	21.4	7.5	12	18.6	3.0	11	23.4	4.7	10	22.0	4.9

Table 4.6 Mean scores (cm) - Sit and Reach test of flexibility.

		Boys	Girls	Both
	'Daily P.E.'	1.11	3.27	2.30
	'Normal P.E.'	-1.92	-0.70	-1.36
number	'DPE'	9	11	20
	'Normal'	12	10	22

Table 4.7 Mean 'change' scores

- flexibility.

Source	df	ms	F
Group	1	127.5	17.94***
Sex	1	28.89	4.06
Group x Sex	1	2.32	0.33
Residual	38	7.11	
Total	41	10.78	

*** $p < 0.001$

Table 4.8 Analysis of variance using

flexibility 'change' scores.

P.E.' group improved over the Pilot Study year (Tables 4.6, 4.7). While the 'Normal P.E.' girls regressed in flexibility they still exceeded the final measurement of the 'Daily P.E.' boys.

A two-way analysis of variance (table 4.8) was carried out to determine group difference, sex difference and group by sex interaction. 'Change' scores were calculated and used in this analysis.

From table 4.8 it can be seen that there was a difference ($p<0.001$) between the two groups but not between the sexes.

The above results appear to indicate that the programme of daily physical education had a positive effect on the flexibility of the 'Daily P.E.' group.

Source	df	ms	F
Group	1	826.4	7.60**
Sex	1	9.59	0.09
Group x Sex	1	0.76	0.01
Residual	38	108.8	
Total	41	121.8	

** p<0.01

Table 4.9 Analysis of variance using computation 'change' scores.

	Boys		Girls		Both	
	n	mean	n	mean	n	mean
'Daily P.E.'	9	15.8	11	16.5	20	16.2
'Normal P.E.'	12	6.6	10	7.8	22	7.1

Table 4.10 Computation group mean 'change' scores.

4.2 Academic Test Analysis.

Staffordshire Test of Computation.

In the Staffordshire Test of Computation the 'Daily P.E.' group improved more than the 'Normal P.E' group to a significance level of 0.01. This was calculated using a two-way analysis of variance, on 'change' scores, to determine group difference, sex difference and group by sex interaction (table 4.9).

The mean 'change' scores (table 4.10) indicated that the 'Daily P.E.' boys and girls had shown greater improvement than the 'Normal P.E.' boys and girls. However, this may not be as dramatic as table 4.10 would suggest. It was necessary to examine the absolute pre- and post-programme scores to place the 'change' scores in perspective. Using a two-tailed t-test there were no differences at the 0.05 level of significance between the two groups of boys and between the two groups of girls at pre-programme, nor at post-programme. However with a small sample it was possible to look at the absolute scores in more detail.

Accepting the standard score of 100 as the mean arithmetic quotient (Hebron and Pattinson, 1974) the following divisions were created to give a clearer picture of the Pilot Study scores:

	Boys				Girls			
	'Daily P.E.'		'Normal P.E.'		'Daily P.E.'		'Normal P.E.'	
	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-
89-	33%	0%	25%	8%	9%	0%	0%	0%
90-119	44%	22%	58%	75%	91%	64%	90%	90%
120+	22%	78%	17%	17%	0%	36%	10%	10%
Mean	103.3	119.1	102.5	109.1	101.6	118.1	104.2	112.0
sd	17.6	7.4	17.3	13.2	8.1	7.4	11.4	7.0
n	9	9	12	12	11	11	10	10

Table 4.11 Arithmetic quotient divisions, mean scores and standard deviations of Staffordshire Test of Computation.

less than 90 - retarded arithmetically

90-115 - range of normal achievement arithmetically

120 or more - superior arithmetic ability.

This division allowed a two year arithmetic age (approximately) on either side of the chronological age before the child was classified as, either, 'retarded' or 'superior' in arithmetic achievement (table 4.11).

The absolute mean scores showed that the 'Daily P.E.' boys had moved as a group in a positive direction. The scores for the 'Normal P.E.' boys were more spread, and although this group had improved, it was not at the rate of the 'Daily P.E.' boys. While the girls of both groups had an improved arithmetic quotient, the 'Daily P.E.' girls had moved from below the 'Normal P.E.' girls to a superior position.

While three boys in the 'Normal P.E.' group scored below 90 at the pre-programme testing, only one remained below on re-testing at the end of the programme. In the 'Daily P.E.' group, one girl and three boys were recorded as 'retarded' before the programme, but all children in the 'Daily P.E.' group were within the range of 'normal achievement' or better, after the programme. One boy, who had missed the pre-programme testing, was considered a low achiever, and at the post-programme testing scored within the 'retarded' category. However, as in all testing in this study, only children who recorded both test and re-test scores were included in the analysis.

In contrast to the 'Daily P.E.' group, where no child scored less than 105, 6 children in the 'Normal P.E.' group (27%) scored less than 100.

Two boys and one girl in the 'Normal P.E.' group (14%) scored in excess of 120 (superior arithmetic ability) in the pre-programme test, and the same number remained above 120 in the re-testing at the conclusion of the year. In the 'Daily P.E.' group, two boys scored in excess of 120 before the programme, and eleven of the 'Daily P.E.' children (55%) recorded above 120 in the post-programme testing.

It would appear that the children engaged in the daily physical education programme had improved over the children who received a 'normal' physical education programme, in terms of the Staffordshire Test of Computation. This is a trend which will be examined with a larger sample.

Source	df	ms	F
Group	1	0.04	0.01
Sex	1	13.29	4.24*
Group x Sex	1	2.88	0.92
Residual	39	3.14	
Total	42	3.31	

* p<0.05

Table 4.12 Analysis of variance using reading comprehension 'change' scores.

	Boys				Girls			
	'Daily P.E.'		'Normal P.E.'		'Daily P.E.'		'Normal P.E.'	
	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-
'Retarded'	11%	22%	8%	15%	0%	18%	0%	0%
'Normal'	78%	44%	69%	69%	64%	36%	70%	40%
'Superior'	11%	44%	23%	15%	36%	45%	30%	60%
Mean	10.22	11.70	10.57	11.47	11.07	13.11	11.00	13.51
sd	2.21	3.31	1.48	2.17	1.89	3.26	1.25	2.20
n	9	9	13	13	11	11	10	10

Table 4.13 Reading ability divisions, mean scores and standard deviations of Gapadol Reading Comprehension Test.

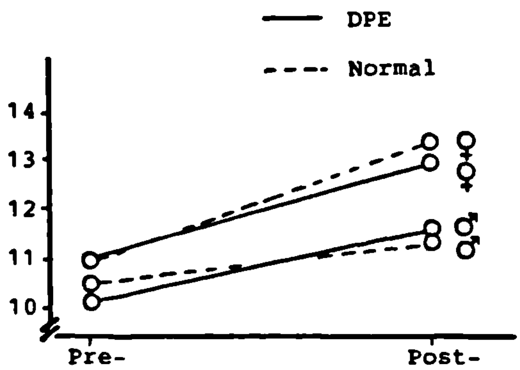


Figure 4.4 Mean reading ages using Gapadol Reading Comprehension Test.

The Gapadol Test of Reading Comprehension.

Using a two-way analysis of variance on the 'change' scores of the Gapadol Test of Reading Comprehension it can be seen from table 4.12 that there was a difference between the sexes at the 0.05 level of significance. Table 4.13 and figure 4.4 indicate that the girls of the 'Normal P.E.' group improved most of all , followed by the 'Daily P.E.' girls. The 'Normal P.E.' boys showed least improvement over the year.

However the 'change' scores should not be looked at in isolation. A two-tailed t-test on the absolute scores failed to show significant differences (p¾0.05) between the two groups of boys and between the two groups of girls at the pre- and post-programme testing.

As in the analysis of the Staffordshire Test of Computation it is possible to examine the scores from the Gapadol test in more detail. The evaluation criteria of reading achievement is set out in the Gapadol Reading Comprehension manual (McLeod and Anderson, 1972). Scores are divided into three categories. A child whose score falls into the bottom 10% of his age group, using the manual norms, is considered to be 'reading retarded', and one whose score places him in the top 10% of his age group is considered to have 'superior reading ability'.

Using these criteria, it can be seen from table 4.13 that, at the start of the programme, one of the children in the 'Normal P.E.' group was classified in the 'reading retarded' category and several children were on the borderline. At the conclusion of the programme two boys were in the 'reading retarded' category; the original child and one of the borderline children. The distribution was identical in the 'Daily P.E.' group before the programme started, but on completion of the year two boys and two girls were placed in the 'reading retarded' category. While two of the children had been borderline cases, one girl had regressed.

Three boys and three girls (26%) in the 'Normal P.E.' group recorded 'superior reading ability' scores before the programme and on completion of the year two boys and six girls (34%) were placed in the 'superior reading ability' category.

In the 'Daily P.E.' group, four girls and one boy (25%) had scored in the 'superior reading ability' category before the programme and on re-testing 4 boys and 5 girls (40%) were in this category. One boy and one girl in the 'Daily P.E.' group reached the ceiling 'reading age' of 16 years 11 months on this test. Eighty per cent of the 'Daily P.E.' children improved their reading attainment over the year, with 10% regressing. Forty nine per cent of the 'Normal P.E.' class improved while 39% regressed over the same period. Tables 4.12 and 4.13 would seem to indicate that regardless of the programme of physical education the girls perform better, as a group, than the boys, in reading attainment.

While there is little evidence to suggest that this daily physical education programme aids reading comprehension it can be said that the increased time spent on physical education in the Pilot Study had not been detrimental to the children's reading attainment.

From the testing conducted in this study, it could be argued that the increase in time spent on physical education has not been at the expense of the child's performance in the basics of reading and computation. Indeed it could be inferred that many children may have benefited in academic achievement from engaging in the daily physical education programme in the Pilot Study.

4.3 Affective Analysis.

'School Questionnaire - S7'.

The 'Attitude to School Questionnaire' (Barker Lunn, 1969) was administered to determine whether there were any attitudinal differences between the children on daily physical education and the children on 'normal' physical education, before and after the daily physical education programme.

It was hoped that the extraneous factors acting upon attitudes would be reduced by the timing of test administration. This allowed the questionnaires to be carried out with the same class teachers at pre- and post-programme. It was important to examine the results for indications of attitudinal change and trends for future investigation.

The 'Attitude to School Questionnaire' consists of ten scales. Initially all ten scales were analysed and interpreted. From examination of the mean scores obtained at pre- and post-programme it appeared that the children in both groups had improved on almost all scales but that the 'Daily P.E.' group had improved to a greater extent than the 'Normal P.E.' group on most scales (Table 4.14). However, interpretation of the results using all ten scales was complex. Because of the similarity between scales the

'Cluster'	♂ 'DPE'	♂ 'Normal'	♀ 'DPE'	♀ 'Normal'
School Related Attitudes	9.40	8.31	12.64	8.20
Pupil's Personality	-0.10	0.92	1.91	1.10

Table 4.15 'Change' scores in cluster scales of School Questionnaire- S7.

analysis was simplified by dividing them into the 'two neat clusters' identified by Barker Lunn (1969). Scales A-G, which were closely related to attitudes to school and school work, were summed and labelled 'School Related Attitudes'. Scales G-J, which were closely related to the social relations and personality of the pupil have also been summed and, for convenience, referred to in this study as 'Pupil's Personality'. Scale G, 'Relationship with teacher', was common to each cluster. Each child had a pre-programme and post-programme score for each cluster. The summed results in both clusters were examined in terms of 'absolute' scores and 'change' scores.

A two-way analysis of variance was carried out on the 'change' scores of 'School Related Attitudes' and 'Pupil's Personality'. There was no group difference, sex difference or interaction across group and sex ($p<0.05$). However, tables 4.14 and 4.15 did indicate an improvement by all groups in 'School Related Attitudes' but not by the 'Daily P.E.' boys in 'Pupil's Personality'.

A two-tailed t-test was used to determine whether the two groups were different at pre-programme and at post-programme testing in the two clusters.

Boys

Cluster	'Daily P.E.' Pre-		'Daily P.E.' Post-		'Normal P.E.' Pre-		'Normal P.E.' Post-	
School Related Attitudes	27.5	9.5	36.9	4.4	24.2	8.1	32.5	5.7
Pupil's Personality	18.2	4.1	18.1	5.6	15.5	3.1	16.5	3.8

Girls

Cluster	'Daily P.E.' Pre-		'Daily P.E.' Post-		'Normal P.E.' Pre-		'Normal P.E.' Post-	
School Related Attitudes	22.6	11.6	35.3	7.9	24.3	9.2	32.5	6.4
Pupil's Personality	16.4	2.4	18.3	5.1	14.7	3.1	15.8	3.2

Table 4.16 Mean scores and standard deviations on 'clusters' from School Questionnaire - S7.

In 'School Related Attitudes' there were no differences between the two groups, neither girls nor boys, at pre-programme and at post-programme ($p<0.05$). The 'Normal P.E.' girls had a superior pre-programme mean score but the 'Daily P.E.' girls had a superior post-programme mean result. The 'Daily P.E.' boys had a superior 'School Related Attitudes' mean score to the 'Normal P.E.' boys at the pre- and post-programme testing (Table 4.16).

Although the 'Daily P.E.' group, boys and girls, had superior pre- and post-programme mean scores to the 'Normal P.E.' group, there were no differences between the two groups in 'Pupil's Personality' at the 5% level of significance. Both sets of girls and the 'Normal P.E.' boys showed an improved mean score from pre- to post-programme testing. Although regressing slightly from pre-programme score the 'Daily P.E.' boys still had a superior post-programme mean score to the boys and girls of the 'Normal P.E.' group.

In this small study there did not appear to be a great deal of difference between boys and girls on either cluster.

The Children's Behaviour Questionnaire.

The Children's Behaviour Questionnaire (Rutter, 1967) was completed by the two class teachers. When the pre-Pilot programme questionnaires were analysed four children were identified as 'disturbed' (test score of 9 and over). One boy from the 'Daily P.E.' group, and two boys and one girl from the 'Normal P.E.' group. The three children in the 'Normal P.E.' group were also designated 'anti-social', while the 'Daily P.E.' boy had equal 'neurotic' and 'anti-social' sub-scores which is categorised as 'undifferentiated'.

When the post-programme re-test was analysed six children were classified disturbed; a different boy in the 'Daily P.E.' group and five boys (three new, two originals) from the 'Normal P.E.' group. Two boys (one 'Daily P.E.' and one 'Normal P.E.') were designated 'neurotic', three designated 'anti-social' and one 'undifferentiated'.

There are several factors which could have contributed to apparent stability in behaviour by the 'Daily P.E.' group and the increase in disturbed behaviour by the 'Normal P.E.' children.

While the 'Attitude to School Questionnaire' examined group mean scores the 'Children's Behaviour Questionnaire' examined individual cases. Consequently it could be valuable to use the latter to identify subjects within the sample, and to examine these children individually, as case studies, in terms of physical, attitudinal and academic test results.

	Boys				Girls			
	'Daily P.E.'		'Normal P.E.'		'Daily P.E.'		'Normal P.E.'	
	pre-	post-	pre-	post-	pre-	post-	pre-	post-
mean	31	18	23	23	21	13	24	13
sd	18.8	17.4	18.6	11.6	20.9	12.9	15.1	10.0
n	11		12		8		10	

Table 4.17 Mean absences from school from primary 5 to primary 6.

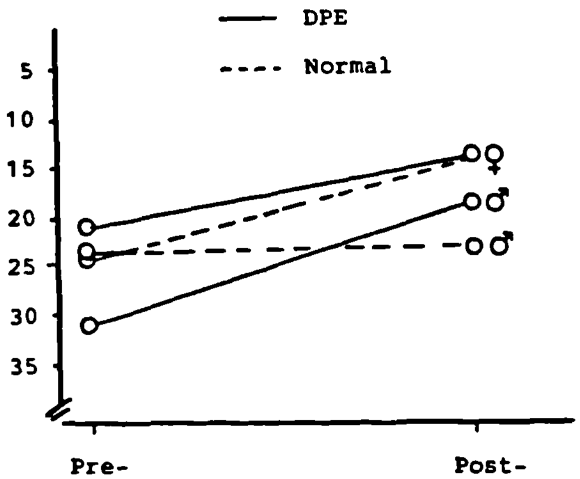


Figure 4.5 Mean absences from school from primary 5 to primary 6.

4.4 Analysis of Attendance.

This analysis required that the child had an attendance record in the school for the session preceding the Pilot Study programme. The number of cases being analysed in this section has been reduced. In the 'Daily P.E.' group two children have been withdrawn from the sample. Prior to the commencement of the daily physical education programme one girl had an abdominal problem diagnosed. Early in the Pilot Study year she underwent corrective surgery which resulted in a prolonged absence from school. She accumulated 115 absences which would have skewed the analysis of this small sample. Another girl enrolled at the school mid-way through the pre-'Pilot' year. Consequently both girls were withdrawn from the analysis of attendance.

The girls in the 'Daily P.E.' and 'Normal P.E.' groups had similar attendance profiles (table 4.17, figure 4.5). The 'Normal P.E.' girls had a slightly higher mean absence rate than the 'Daily P.E.' girls (24:21) in the year preceding the 'Pilot' year. At the conclusion of the programme the two groups had an identical attendance profile.

The mean absence scores of the 'Daily P.E.' boys indicated an inferior attendance record to the

'Normal P.E.' boys before the programme (table 4.17, figure 4.5). However, in the 'Pilot' year the mean absence rate of the 'Normal P.E.' boys remained constant while the 'Daily P.E.' boys reduced their absences by 42%. The girls had a better attendance record than the boys.

Although the sample was very small it would appear from this analysis that the 'Daily P.E.' boys had an improved attendance record which may be attributed to the programme.

4.5 Significant Others.

Head Teacher.

The head teacher and the class teacher examined where time could have been saved in the initial adjustment stages of the programme. All classroom practices were examined and questioned, and textbook exercises were restricted only to those which were relevant and of true educational value.

The head teacher commented that each day was demanding yet rewarding for the class teacher (appendix E). She also commented upon the constructive playground play by the daily physical education children. She felt that the physical education programme seemed to give them a sense of purpose, a feeling of success, greater personal esteem and a sense of maturity. The head teacher stated that if the children had not gained in academic attainment during the daily physical education programme she was certain that they had not dropped below those of the normal physical education group. It was her opinion that because of the children's new found self-awareness, confidence and purpose, the beneficial gains had been emotional and social.

Class teacher.

In the Pilot Study the class teacher reported that initially she felt that she was not covering as much of the normal classroom work as she would have liked (appendix B). She changed her approach and did more actual teaching, used less time-consuming exercises and critically selected television programmes which were of relevance to her work. It is documented in the literature that much of the work in which children engage can be boring, 'dull, repetitive tasks that make little or no claim on their intelligence.' (Holt, 1971) The class teacher tested the reading of the remedial children early in the year (November) and reported that they had fallen slightly behind. When re-tested in February they had caught up and appeared to be showing greater concentration and better quality of work.

The co-operation between class teacher and specialist ensured that physical education situations which had implications for academic learning were maximised. The use of physical activity as the main agent or supporting vehicle in topic study proved extremely successful.

The class teacher was confident that the teaching she had done with less time was better than she had being doing with more time. She thought that the programme had brought the best out in her and that she 'had achieved a standard of teaching of which she was really proud.'

Children's Diaries.

The daily physical education children completed a daily diary throughout the programme. In this they recorded their mode of travel to and from school, rising and retiring times, activities outside of school, including weekends. Analysis of the diaries did not provide information which would be of value to the study. They did show that the boys tended to go to bed later at night and get up earlier in the morning than the girls. The boys also tended to be more physically active after school and at the weekends than the girls. It was not possible to discern from the information in the diaries whether the children were more active or less active at the start or the end of the programme. The parental response was likely to be a more reliable guide to changes in the child's activity pattern.

However, the children did record their activities during the October Week holiday. Each day was divided into three periods; morning, afternoon and evening. Almost every child watched television each day on one, two and even three of the periods. The daily programmes of five children, considered by the teacher to have learning difficulties, were examined. The four boys were active in almost every one of the 27 periods (9 days). However, the one girl was physically active in 7 of the 27 periods and watched television for 18 periods, including every morning and three full days.

The daily diary was very demanding of the teacher's time. The format did not provide clear information and required the children to recall trivia. Consequently it was considered unreliable and it was decided not to continue with a pupil diary in the extended study.

Parental Responses.

In the Pilot Study, the parents of the children engaged in the daily physical education programme were asked to respond to a questionnaire (appendix D) regarding their child and the programme. Of the 25 questionnaires sent out, 21 were completed and returned (84%). All parents felt that: they had no regrets about the Pilot Study year and the programme in which their children had taken part; the amount of time spent on physical education in the Pilot Study was about right; they would like the programme to continue. Most parents made positive comments about the programme. The parents of one remedial child commented upon the boy's gain in confidence. This was supported by the school psychologist who reported that the boy had learned to co-operate in a group, to accept defeat without total loss of confidence, and to persevere and complete tasks which previously he would not have attempted. In her conversation with the boy he expressed enthusiasm about the programme of daily physical education and it was this which she felt was a factor in his improved attitude to school. Another parent of a remedial child commented upon a positive change in relationship between his son and himself; the father had become proud of his son's interest and success in racquet sports which had led to greater social interaction between them.

Adviser in Physical Education.

The adviser stated that, although he was unaware of the full results from the Pilot Study, the early indications fully justified his personal belief in the value of daily activity and the effect it could have on the ambiance of a school and its pupils. He also confirmed that the education officers were of the same view as his own and that this was borne out in their acceptance, without qualification, of the amalgamation of the Integrated Primary/Secondary Programme with the Pilot Study in daily physical education into the expanded Linwood Project.

CHAPTER 5.

Linwood Project - Analysis of Motor Fitness.

Introduction.

Every child in this study was required to have a pre-programme (August) and post-programme (June) score. If either of the scores did not exist on a particular item then the child was excluded from any computation involving that item.

Three main statistical measures have been used in the analysis of motor fitness results.

To give indication of trends use has been made of the mean scores of the two groups, 'Daily P.E.' and 'Normal P.E.'. Since the physical growth and development of boys and girls is quite different at this stage, the test scores of the two sexes have, in most instances, been treated separately.

With two scores for each child on each item a new variable was created, a 'change' score. An improvement on an item was an increase in score, the pre- programme score was deducted from the post programme score, and the new variable was created. An improvement in performance is always positive.

The second statistical test, two-way analysis of variance, helped to provide answers to several questions regarding the two groups ('Daily P.E.' and 'Normal P.E.'): did the daily physical education programme have an influence on the performance of the 'Daily P.E.' children?; did boys differ significantly from girls?; was there an interaction effect of programme and sex in terms of pupil achievement? The null hypotheses, in respect of these questions, were that neither the daily physical education programme, nor sex difference, nor any interaction of these two factors affected Motor Fitness as outlined below.

In this study the analyses of 'change' scores were restricted in interpretation. 'Change' scores did not necessarily reflect the actual influence of the programme since they obscured the absolute start and finish scores. The range of pre-programme scores did not allow the high performer to make the same magnitude of improvement as the lower performer. It was important, therefore, to take into account the two scores for each child. It was also important to find out if there was a significant difference within each sex group, that is, between the two groups of boys and between the two groups of girls. Consequently a third test was used, a two-tailed t-test. This determined whether or not the means of the two groups, 'Daily P.E.' and 'Normal P.E.', boys and girls, were significantly different.

The code ✠ has been included in tables where it was necessary to use Separate Variance Estimate (chapter 4.1).

All the children involved in the study at the primary 7 stage ('Daily P.E.' and 'Normal P.E.') were tested in August, at the start of the session, and again in June, on completion of the school year.

The 'Daily P.E.' children at the primary 7 stage fell into two categories. Firstly there were children who were experiencing 'Daily Physical Education' for the first time and who are referred to as Model 2. Secondly there were children who had experienced 'Daily Physical Education' in primary 6 and were continuing on daily physical education for a second year. The latter group are referred to as Model 3. The same children who were following a 'Normal P.E.' programme were used in both Models 2 and 3.

It is not the intention in this study to examine the combined primary 7 daily physical education groups (Models 2 and 3).

The children in Models 2 and 3 undertook the same physical battery as the primary 6 children. In all three models testing was conducted at the same time of year and under the same test conditions.

The six-item Canadian Association of Health, Physical Education and Recreation (CAHPER) Fitness-Performance Test II (1979) has been used to test the physical fitness of the children in this study. In order to obtain a single measure of CAHPER fitness, the raw scores of the six items were standardised, converted into transformed (T) scores, and summed (Watkins, 1985).

The combination of the elements included in the CAHPER Fitness-Performance II Test, together with flexibility, constitute Motor Fitness in this study.

Motor Fitness Test Analysis.

5.1 Model 1.

All the children engaged in daily physical education at the primary 6 stage, in this study, were experiencing the programme for the first time. Consequently all scores at pre- programme testing were from children who previously had experienced only 'normal' physical education programmes in their respective schools. On completion of the primary 6 stage the 'Daily P.E.' groups had experienced one academic session on the daily physical education programme while the other children had undertaken the 'normal' physical education programmes of their respective schools. Each pre-programme test was completed in August at the start of the school year, and the post-programme testing was conducted in June of the same school year.

In one school it was evident that each child had a grossly skewed score on endurance run and that there had been a mechanical fault with a stop watch. When the data were analysed in late June there was no opportunity to re-test the children. The data on this item, with that particular school, have been rejected.

	Shuttle Run			S. Long Jump			Sit ups		
Source	df	ms	F	df	ms	F	df	ms	F
Group	1	5.33	94.37***	1	0.26	13.41***	1	66.6	0.82
Sex	1	0.37	6.61*	1	0.20	10.68***	1	992.5	12.28***
Group x Sex	1	0.10	1.79	1	0.02	1.06	1	1.04	0.01
Residual	286	0.06		293	0.02		291	8.08	
Total	289	0.08		296	0.02		294	83.60	

	Flex. Arm Hang			50 Metre Run			Endurance Run		
Source	df	ms	F	df	ms	F	df	ms	F
Group	1	1158	4.84*	1	5.91	38.85***	1	0.53	5.18*
Sex	1	728	3.04	1	0.01	0.05	1	0.06	0.57
Group x Sex	1	512	2.14	1	0.00	0.01	1	0.01	0.11
Residual	292	239		289	0.17		233	0.10	
Total	295	255		292	0.18		236	0.10	

*** $p<0.001$ ** $p<0.01$ * $p<0.05$

Table 5.1 Analysis of variance using 'change' scores of CAHPER Fitness-Performance II Test.

	Shuttle Run			S.Long Jump			Sit ups		
	♂	♀	Both	♂	♀	Both	♂	♀	Both
'Daily P.E.'	0.19	0.28	0.23	0.07	0.13	0.09	5.17	8.78	6.75
n	112	97	209	120	95	215	120	93	213
'Normal P.E.'	-0.08	-0.06	-0.07	0.02	0.04	0.03	3.98	7.87	5.78
n	43	38	81	44	38	82	44	38	82

	Flex. Arm Hang			50 Metre Run			Endurance Run		
	♂	♀	Both	♂	♀	Both	♂	♀	Both
'Daily P.E.'	5.27	10.08	7.36	0.33	0.35	0.34	0.33	0.30	0.32
n	121	93	214	117	96	213	88	71	159
'Normal P.E.'	3.58	2.50	3.07	0.02	0.02	0.02	0.24	0.19	0.22
n	43	39	82	43	37	80	41	37	78

Table 5.2 Group mean 'change' scores of CAHPER Fitness-Performance II Test.

Consequently the sample size in endurance run was smaller than on the other test items.

A two-way analysis of variance was carried out on each of the items of the CAHPER Fitness-Performance II test battery.

The 'change' scores for each child were computed and the results are shown in Tables 5.1 and 5.2.

The examination of group differences in 'change' scores indicated the 'significant' superiority of the 'Daily P.E.' group on all items except 'sit-ups'. The children, boys and girls, on daily physical education had improved on each item to a greater extent than their counterparts on the 'Normal P.E.' programme (table 5.2).

The mean scores of the 'Normal P.E.' boys and girls had regressed over the year on the shuttle run. This was also true of the 'Normal P.E.' boys in the Pilot Study. The 'Daily P.E.' girls improved at a greater rate than the boys on every item except endurance run (table 5.2). This did not suggest that the girls were superior to the boys in performance on these items, rather that improvement over the year was greater. It can be seen that the magnitude of the improved performance by the 'Daily P.E.' girls had influenced the scores of the overall group of girls in

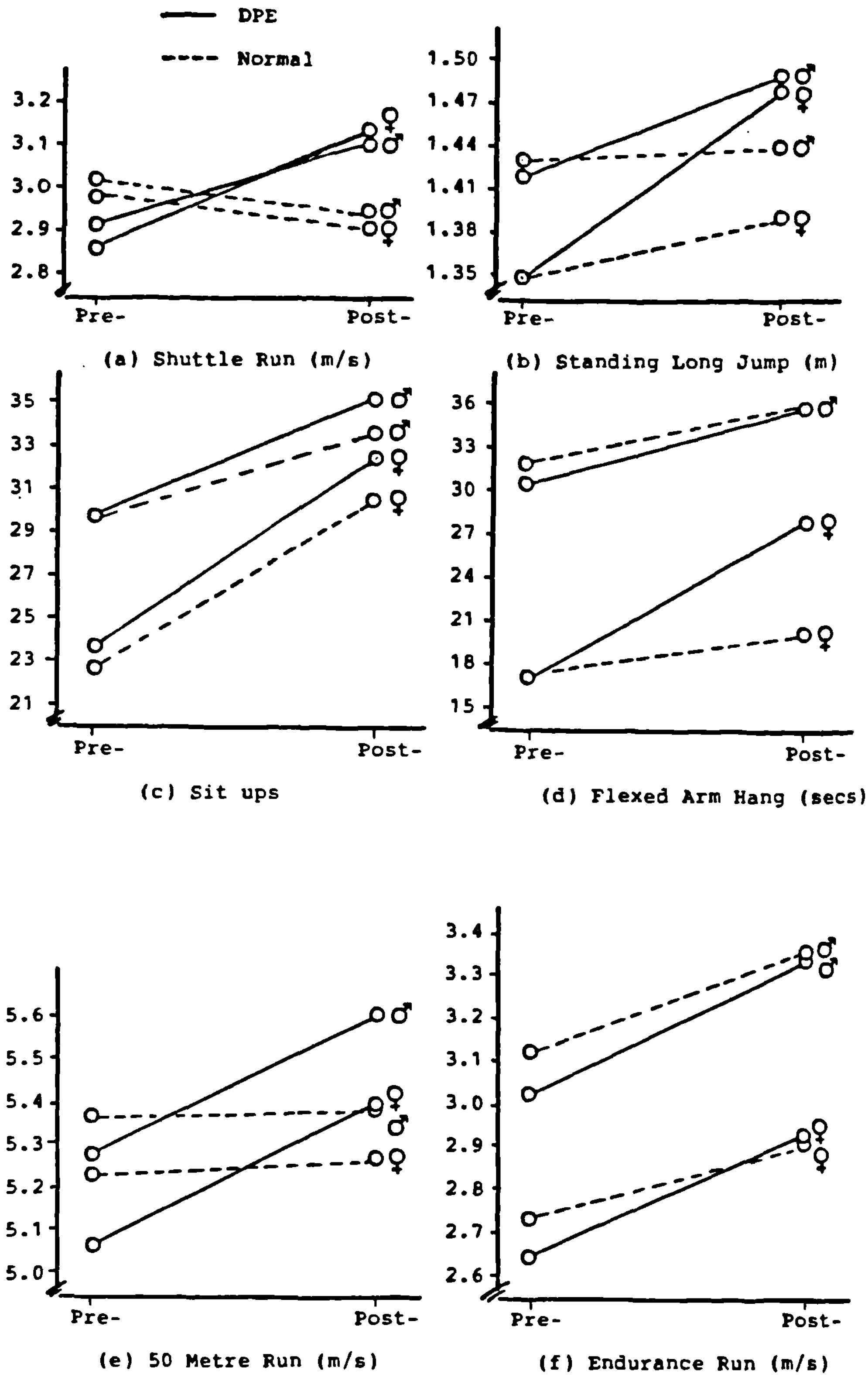


Figure 5.1 (a-f) Mean differences from pre- to post-programme on CAHPER Fitness-Performance II Test.

the shuttle run ($p<0.05$), standing long jump ($p<0.001$) and sit-ups ($p<0.001$) (table 5.1).

In order to examine the changes, figures 5.1.a-f were drawn to display the mean differences from pre- to post-programme results for each item of the CAHPER Fitness-Performance II Test.

Figures 5.1.d and 5.1.f showed the relative mean positions of the groups and sexes on flexed arm hang and endurance run. On these items the 'Normal P.E.' boys scored higher than the 'Daily P.E.' boys. On all other items, at post-programme testing, the 'Daily P.E.' boys scored higher than the 'Normal P.E.' boys. However, the most interesting post-programme results were those of the 'Daily P.E.' girls who scored higher than the 'Normal P.E.' girls on every item, and scored higher in the post-programme results than the 'Normal P.E.' boys on shuttle run (fig.5.1.a), standing long jump (fig.5.1.b), and 50 metre run (fig.5.1.e). They also scored higher than the 'Daily P.E.' boys on shuttle run (fig.5.1.a).

Using the two-tailed t-test the 'Normal P.E.' boys were found to be superior to the 'Daily P.E.' boys, at pre-programme testing, on shuttle run ($p<0.05$). On all other items there were no significant differences between the two boys' groups at pre-programme testing. However, at post-programme testing, the 'Daily P.E.' boys were superior to the

Boys	'Daily P.E.'		'Normal P.E.'			
Variable	mean	sd	mean	sd	t	p
Shuttle Run (m/s)	2.92	0.23	3.03	0.23	2.51	0.013
(pre-) n	112		43			
Shuttle Run (m/s)	3.11	0.25	2.95	0.19	3.76	0.000
(post-) n	112		43			
50 Metre Run (m/s)	5.61	0.43	5.39	0.42	2.84	0.005
(post-) n	117		43			

Table 5.3 Two-tailed t-test on CAHPER Fitness-Performance II Test (boys).

Girls	'Daily P.E.'		'Normal P.E.'			
Variable	mean	sd	mean	sd	t	p
Shuttle Run (m/s)	2.86	0.22	2.98	0.29	✣2.44	0.018
(pre-) n	97		38			
Shuttle Run (m/s)	3.14	0.28	2.92	0.24	4.33	0.000
(post-) n	97		38			
St. Long Jump	1.48	0.15	1.39	0.18	2.88	0.005
(post-) n	95		38			
Flex. Arm Hang	27.56	20.26	20.23	13.58	✣2.42	0.017
(post-) n	93		39			
50 Metre Run (m/s)	5.06	0.32	5.24	0.49	✣2.12	0.039
(pre-) n	96		39			

Table 5.4 Two-tailed t-test on CAHPER Fitness-Performance II Test (girls). ✣Separate Variance.

	'Daily P.E.'		'Normal P.E.'			
Girls	mean	sd	mean	sd	t	p
	51.66	1.32	47.04	1.39	2.27	0.03
n	64		36			

Table 5.5 Two-tailed t -test on summed 'T' scores of CAHPER Fitness-Performance II test (girls).

'Normal P.E.' boys (table 5.3) on shuttle run ($p<0.001$) and 50 metre run ($p<0.01$). The 'Normal P.E.' girls were superior to the 'Daily P.E.' girls at pre-programme testing on shuttle run ($p<0.05$) and 50 metre run ($p<0.05$). At post-programme testing the 'Daily P.E.' girls were superior to the 'Normal P.E.' girls (table 5.4) on shuttle run ($p<0.001$), standing long jump ($p<0.01$) and flexed arm hang ($p<0.05$).

A two-tailed t-test was used on the summed 'T' scores from the CAHPER Fitness-Performance II battery at pre- and post-programme testing. The 'Daily P.E.' boys had a similar pre-programme mean total and a superior post-programme mean total to the 'Normal P.E.' boys. However, there was no difference between the two groups of boys at the 0.05 level of significance. Although the 'Daily P.E.' girls had an inferior pre-programme mean total, there was a significant difference ($p<0.05$) between the two groups at post-programme testing. The 'Daily P.E.' girls were superior to the 'Normal P.E.' girls (table 5.5).

In terms of flexibility, 290 children at the primary 6 stage (Model 1) were measured using the Wells and Dillon 'sit and reach' test (1952). From table 5.6, which displayed the absolute mean scores for boys and girls in each group, it could be seen that the boys in each group had lower initial scores than the girls.

	Boys						Girls					
	'Daily P.E.'			'Normal P.E.'			'Daily P.E.'			'Normal P.E.'		
	n	mean	sd	n	mean	sd	n	mean	sd	n	mean	sd
Pre-	115	17.52	3.14	43	16.93	6.65	94	18.96	3.25	38	20.24	5.54
post-	115	18.45	3.48	43	17.58	6.86	94	20.64	3.07	38	21.53	5.59

Table 5.6 Mean scores and standard deviations on Flexibility.

Source	DF	MS	F
group	1	6.40	1.15
sex	1	37.16	6.65**
group x sex	1	0.18	0.03
residual	286	5.59	
total	289	5.59	

** $p < 0.01$

Table 5.7 Analysis of variance using 'change' scores of flexibility.

	Boys	Girls
mean 'change'	0.85	1.57
number	158	132

Table 5.8 Mean 'change' scores of Flexibility.

The 'Daily P.E.' boys had superior pre-programme and post-programme mean flexibility scores than the 'Normal P.E.' boys. The 'Normal P.E.' girls had a superior pre-programme mean score than the 'Daily P.E.' girls. Although the 'Daily P.E.' girls closed the gap, in terms of mean score, the 'Normal P.E.' girls had a higher post-programme mean flexibility score.

A two-way analysis of variance was used on the 'change' scores. There was a difference between the sexes at the 0.01 level of significance (table 5.7).

From table 5.8 it could be seen that the girls had improved to a greater extent than the boys.

A two-tailed t-test was used to examine differences between the two groups, 'Daily P.E.' and 'Normal P.E.', boys and girls. There were no significant differences ($p < 0.05$) at the pre- and post-programme testing.

As with the 'Pilot Study' the physical results suggested that the children engaged in daily physical education at primary 6, in this study (Model 1), had improved in motor fitness at a greater rate than the children on 'normal' physical education.

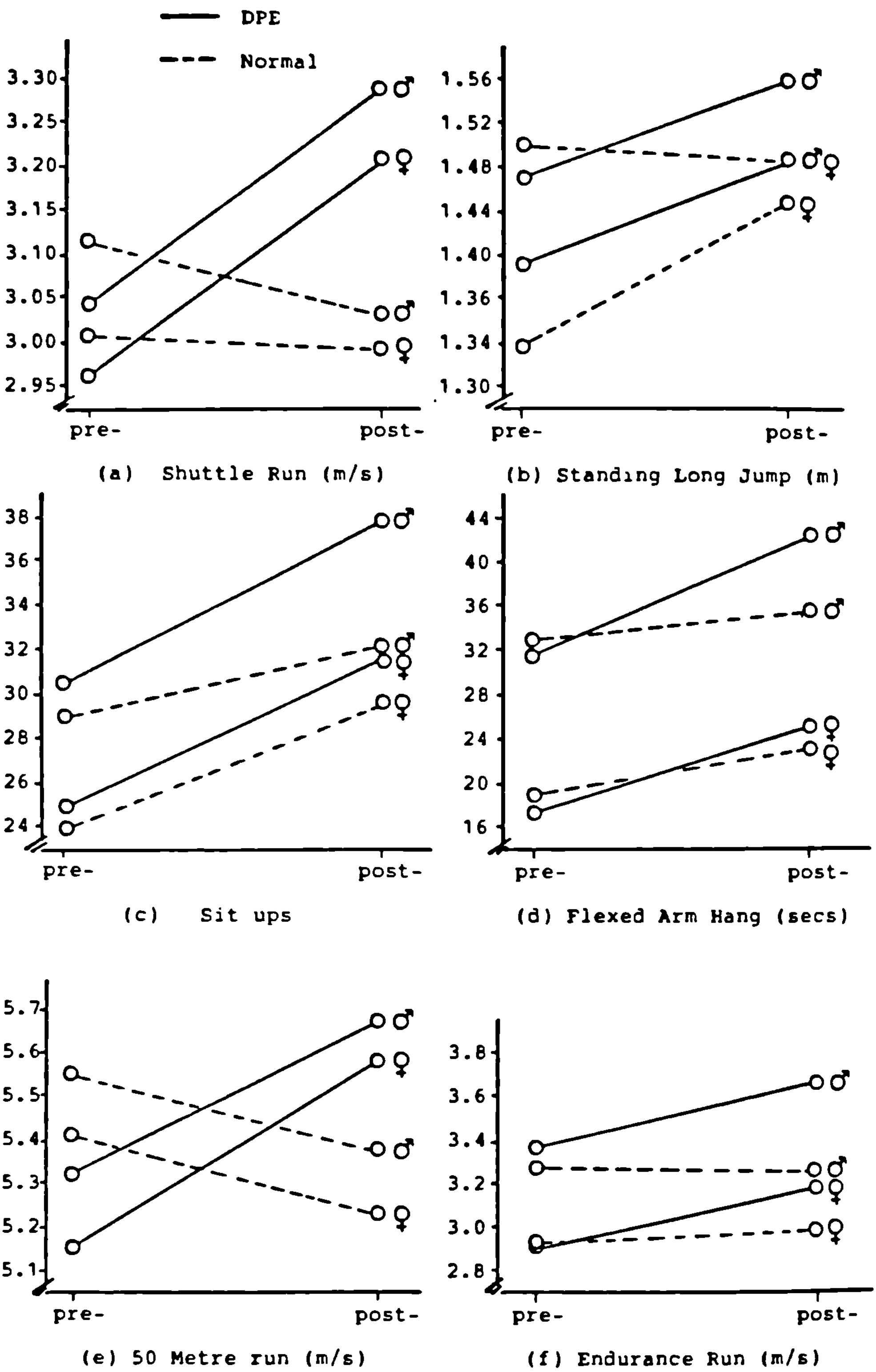


Figure 5.2 (a-f) Mean differences from pre- to post-programme on CAHPER Fitness-Performance II Test.

5.2 Model 2.

Figures 5.2.a-f display the mean scores of boys and girls in the 'Daily P.E.' and 'Normal P.E.' groups.

With the exception of sit-ups and endurance run the 'Normal P.E.' boys were superior in mean pre-programme test scores but the 'Daily P.E.' boys were superior in mean post-programme scores to the 'Normal P.E.' boys on all six items. The 'Daily P.E.' boys improved on all six items while the 'Normal P.E.' boys regressed on shuttle run, standing long jump, 50 metres run and endurance run.

The 'Normal P.E.' girls were superior on shuttle run, flexed arm hang, 50 metres run and endurance run, to the 'Daily P.E.' girls in the pre-programme test scores. However, the 'Daily P.E.' girls were superior to the 'Normal P.E.' girls in mean post-programme test scores on all six items. The 'Daily P.E.' girls improved on all six items while the 'Normal P.E.' girls regressed on shuttle run and 50 metres run. The 'Daily P.E.' girls from having inferior pre-programme mean test scores to the boys in all six items, scored higher mean scores than the 'Normal P.E.' boys on shuttle run and 50 metres run.

	Shuttle Run			S. Long Jump			Sit ups		
Source	df	ms	F	df	ms	F	df	ms	F
Group	1	3.92	97.30***	1	0.09	5.03*	1	26.8	3.64
Sex	1	0.01	0.29	1	0.07	4.00*	1	76.6	1.18
Group x Sex	1	0.06	1.44	1	0.13	6.85**	1	38.1	0.59
Residual	217	0.04		221	0.02		224	65.1	
Total	220	0.06		224	0.02		227	65.8	

	Flex. Arm Hang			50 Metre Run			Endurance Run		
Source	df	ms	F	df	ms	F	df	ms	F
Group	1	1336	5.98*	1	13.35	95.78***	1	2.41	26.0***
Sex	1	292	1.31	1	0.12	0.83	1	0.02	0.19
Group x Sex	1	307	1.37	1	0.07	0.51	1	0.02	0.63
Residual	219	224		216	0.14		138	0.09	
Total	222	230		219	0.20		141	0.11	

*** $p<0.001$ ** $p<0.01$ * $p<0.05$

Table 5.9 Analysis of variance using 'change' scores of CAHPER Fitness-Performance II Test.

	Shuttle Run			S.Long Jump			Sit ups		
	♂	♀	Both	♂	♀	Both	♂	♀	Both
'Daily P.E.'	0.25	0.25	0.25	0.09	0.10	0.10	6.41	7.10	6.74
n	88	76	164	89	79	168	90	81	171
'Normal P.E.'	-0.09	-0.02	-0.05	-0.01	0.11	0.05	3.14	5.71	4.40
n	29	28	57	29	28	57	29	28	57

	Flex. Arm Hang			50 Metre Run			Endurance Run		
	♂	♀	Both	♂	♀	Both	♂	♀	Both
'Daily P.E.'	11.27	7.65	9.53	0.35	0.42	0.38	0.28	0.28	0.28
n	88	81	169	87	.77	164	46	40	86
'Normal P.E.'	2.76	4.62	3.72	-0.17	-0.19	-0.18	-0.01	0.04	0.02
n	26	28	54	28	28	56	27	29	56

Table 5.10 Group mean 'change' scores of CAHPER Fitness-Performance II Test.

The mean scores of pre- and post-programme testing give an indication of the trends in the physical battery.

To examine the effects of the daily physical education programme using 'change' scores a two-way analysis of variance was carried out on each item of the CAHPER Fitness-Performance II Test.

There were significant differences between the groups in shuttle run ($p < 0.001$), standing long jump ($p<0.05$), flexed arm hang ($p<0.05$), 50 metre run ($p<0.001$) and endurance run ($p<0.001$), (table 5.9).

Although the 'Daily P.E.' group were superior in group 'change' scores to the 'Normal P.E.' on all six items (table 5.10), there was no difference between the groups on sit ups at the 0.05 level of significance.

Table 5.9 indicated a group by sex interaction ($p < 0.01$) in standing long jump. At pre-programe testing the 'Normal P.E.' boys had the highest score and the 'Normal P.E.' girls the lowest score. However, the 'Normal P.E.' boys regressed on this item and the 'Normal P.E.' girls made the greatest improvement of all four groups over the year (table 5.10). Nevertheless, figure 5.2.b indicated that the 'Daily P.E.' children, boys and girls, had

Girls Variable	'Daily P.E.' mean	sd	'Normal P.E.' mean	sd	t	p
Shuttle Run (m/s)	3.21	0.26	2.99	0.19	4.10	0.000
(post-) n	76		28			
50 Metre Run (m/s)	5.16	0.43	5.42	0.36	2.88	0.005
(pre-) n	77		28			
50 Metre Run (m/s)	5.58	0.45	5.23	0.40	3.58	0.001
(post-) n	77		28			

Table 5.13 Two-tailed t-test on CAHPER Fitness-Performance II Test (girls).

Boys	'Daily P.E.' mean	sd	'Normal P.E.' mean	sd	t	p
	52.01	9.87	46.17	9.29	2.29	0.03
n	42		22			

Table 5.14 Two-tailed t -test on summed 'T' scores of CAHPER Fitness-Performance II test (boys) (post-programme).

for the boys' groups this was significantly so in shuttle run ($p<0.001$), sit ups ($p<0.05$), 50 metre run ($p<0.001$), and endurance run ($p<0.001$). The significant items in the girls' groups, at post-programme (table 5.13), were shuttle run ($p<0.001$) and 50 metre run ($p<0.001$).

The results from the CAHPER Fitness-Performance II Test indicated that the children engaged in the daily physical education programme at primary 7 in Model 2 had improved on all items and were superior to the 'Normal P.E.' on all items.

A two-tailed t-test was used on the summed 'T' scores from the CAHPER Fitness-Performance II battery for the pre- and post-programme. Although the 'Daily P.E.' boys had a superior pre-programme mean total to the 'Normal P.E.' boys there was no difference between the two groups of boys at a 0.05 level of significance. However, there was a significant difference ($p<0.05$) at post-programme when the 'Daily P.E.' boys had improved their total score and the 'Normal P.E.' boys had regressed (table 5.14). The 'Daily P.E.' girls had superior pre- and post-programme mean total CAHPER scores to the 'Normal P.E.' girls. Although the 'Daily P.E.' girls had increased their total at re-test while the 'Normal P.E.' had regressed over the same period, there was no

	Shuttle Run		St. Long Jump		Sit ups	
Sex	♂	♀	♂	♀	♂	♀
'change'	0.17	0.18	0.07	0.10	5.6	6.7
n	117	104	118	107	119	109

	F. Arm Hang		50 M. Run		Endur. Run	
Sex	♂	♀	♂	♀	♂	♀
'change'	9.3	6.9	0.22	0.26	0.17	0.18
n	114	109	115	105	73	69

Table 5.11 'Change' scores for sex on CAHPER Fitness-Performance II Test.

Boys		'Daily P.E.'		'Normal P.E.'			
Variable		mean	sd	mean	sd	t	p
Shuttle Run (m/s)		3.29	0.26	3.03	0.21	✠ 4.83	0.000
(post-)	n	88		29			
Sit ups		36.9	9.73	32.2	10.0	2.26	0.025
(post-)	n	90		29			
50 Metre Run (m/s)		5.33	0.37	5.55	0.42	2.68	0.008
(pre-)	n	87		28			
50 Metre Run (m/s)		5.68	0.41	5.38	0.37	3.47	0.001
(post-)	n	87		28			
Endurance Run (m/s)		3.66	0.40	3.26	0.50	3.72	0.000
(post-)	n	46		27			

Table 5.12 Two-tailed t-test on CAHPER Fitness-Performance II Test (boys). ✠ Separate Variance

for the boys' groups this was significantly so in shuttle run ($p<0.001$), sit ups ($p<0.05$), 50 metre run ($p < 0.001$), and endurance run ($p < 0.001$). The significant items in the girls' groups, at post-programme (table 5.13), were shuttle run ($p< 0.001$) and 50 metre run ($p<0.001$).

The results from the CAHPER Fitness-Performance II Test indicated that the children engaged in the daily physical education programme at primary 7 in Model 2 had improved on all items and were superior to the 'Normal P.E.' on all items.

A two-tailed t-test was used on the summed 'T' scores from the CAHPER Fitness-Performance II battery for the pre- and post-programme. Although the 'Daily P.E.' boys had a superior pre-programme mean total to the 'Normal P.E.' boys there was no difference between the two groups of boys at a 0.05 level of significance. However, there was a significant difference ($p<0.05$) at post-programme when the 'Daily P.E.' boys had improved their total score and the 'Normal P.E.' boys had regressed (table 5.14). The 'Daily P.E.' girls had superior pre- and post-programme mean total CAHPER scores to the 'Normal P.E.' girls. Although the 'Daily P.E.' girls had increased their total at re-test while the 'Normal P.E.' had regressed over the same period, there was no

Source	DF	MS	F
group	1	109.21	16.30***
sex	1	1.61	0.24
group x sex	1	10.13	1.51
residual	222	6.70	
total	225	7.15	

***p< 0.001

Table 5.15 Analysis of variance using 'change' scores of flexibility.

	'Daily P.E.'	'Normal P.E.'
mean 'change'	1.38	-0.21
number	168	58

Table 5.16 Mean 'change' scores of flexibility.

	Boys						Girls					
	'Daily P.E.'			'Normal P.E.'			'Daily P.E.'			'Normal P.E.'		
	n	mean	sd	n	mean	sd	n	mean	sd	n	mean	sd
Pre-	88	17.14	2.85	29	16.48	5.30	80	18.84	2.94	29	23.07	6.02
post-	88	18.32	2.70	29	16.55	6.28	80	20.44	3.09	29	22.59	6.64

Table 5.17 Mean scores and standard deviations of flexibility.

	'Daily P.E.'		'Normal P.E.'			
Girls	mean	sd	mean	sd	t	p
	18.84	2.94	23.07	6.02	3.63	0.001
n	80		29			

Table 5.18 Two-tailed t -test of Flexibility - pre-programme (girls).

significant difference between the groups at the 0.05 level of significance.

At the start of primary 7 (August), the 'Daily P.E.' and the 'Normal P.E.' children were measured for flexibility using the Wells and Dillon 'sit and reach' test. The same children were again measured in June at the completion of primary 7.

The two-way analysis of variance using 'change' scores showed group difference at the 0.001 level of significance (table 5.15).

The 'Daily P.E.' group had shown greater improvement over the year than the 'Normal P.E.' group (table 5.16).

The 'Normal P.E.' girls had superior pre- and post-programme mean flexibility scores to the 'Daily P.E.' girls. The 'Daily P.E.' boys had superior mean scores to the 'Normal P.E.' boys, both pre- and post-programme (table 5.17). The 'Normal P.E.' girls regressed over the year while the 'Daily P.E.' girls and both groups of boys improved.

A two-tailed t-test indicated that there were no differences ($p<0.05$) between the two groups of boys at pre- and post-programme testing. The 'Normal P.E.' girls were superior to the 'Daily P.E.' girls ($p\leq 0.001$) at pre-programme testing (table 5.18), but not significantly so at post-programme testing.

These results suggest that the 'Daily P.E.' children in Model 2 had improved in motor fitness, as measured by the CAHPER Fitness-Performance II Test, and in the 'sit and reach' flexibility test, at a greater rate than the children at the same stage in the 'Normal P.E.' group.

5.3 Model 3

Model 3 consisted of the children who had already been involved in the daily physical education programme in primary 6 and were now in primary 7, continuing in their second year of daily physical education. The 'Normal P.E.' children were the same group with the same scores as used in Model 2.

From the analysis of mean scores in Model 2 (tables 5.12 and 5.13), it could be substantiated that the two groups, 'Daily P.E.' and 'Normal P.E.', were homogeneous, in terms of motor development, before the commencement of the programme. Only in the 50 metre run was there a difference between the groups. In this item the boys and the girls of the 'Normal P.E.' group had higher mean scores at pre-programme testing than the 'Daily P.E.' group. With this exception the groups were homogeneous physically at the pre-programme stage using the CAHPER Fitness-Performance II Test battery.

If the programme of daily physical education had had a positive effect on the physical performance of the primary 6 (Model 1) children, then, could it have been expected that the children engaged in a second year of the daily physical education programme ('DPE2') would have had higher pre-programme test

Variable	'DPE2' mean	'DPE2' sd	'Normal P.E.' mean	'Normal P.E.' sd	t	p
St. Long Jump	1.47	0.17	1.34	0.15	2.81	0.007
(girls) n	20		28			
Sit ups	41.2	10.31	29.0	11.34	4.42	0.000
(boys) n	33		29			
Sit ups	37.3	10.04	24.0	9.42	4.71	0.000
(girls) n	20		28			
Flex. Arm Hang	30.0	21.03	19.0	16.22	2.07	0.044
(girls) n	21		28			

Table 5.19 Two-tailed t-test on CAHPER Fitness-Performance II Test (pre-programme).

Variable	'DPE2' mean	'DPE2' sd	'Normal P.E.' mean	'Normal P.E.' sd	t	p
Sit ups	39.5	9.69	32.2	10.04	2.92	0.005
(boys) n	33		29			
Sit ups	40.4	11.04	29.7	9.79	3.55	0.001
(girls) n	20		28			
Flex. Arm Hang	48.9	21.77	36.0	21.56	2.27	0.027
(boys) n	33		26			
Flex. Arm Hang	37.0	25.58	23.6	19.87	2.05	0.046
(girls) n	21		28			
50 Metre Run (m/s)	5.89	0.57	5.38	0.37	4.11	0.000
(boys) n	21		28			
50 Metre Run (m/s)	5.73	0.55	5.23	0.40	3.69	0.001
(girls) n	21		28			

Table 5.20 Two-tailed t-test on CAHPER Fitness-Performance II Test (post-programme).

scores at primary 7 than the 'Normal P.E.' group in Model 2? However, it was not possible to compare the influence of the summer vacation on the 'DPE2' group with the 'Normal P.E.' group since the 'Normal P.E.' groups differed between Model 1 and Model 2 (figures 3.2, 3.4). Consequently it was necessary to look for significant differences between the 'DPE2' group and the 'Normal P.E.' group in Model 2 at pre-programme testing for indications of possible carry-over from the daily physical education programme in Primary 6.

The two-tailed t-test was used to examine for differences between the two groups, 'DPE2' and 'Normal P.E.' on all scores, pre- and post-programme at primary 7 for boys and girls.

At the pre-programme testing there was a significant difference between the boys on sit ups ($p < 0.001$). The differences were significant at the same stage for girls in standing long jump ($p < 0.01$), sit ups ($p < 0.001$) and flexed arm hang ($p < 0.05$), (table 5.19). In all of these items the 'DPE2' children were superior to the 'Normal P.E.' children.

At post-programme testing (table 5.20) the 'DPE2' boys were superior to the 'Normal P.E.' boys in sit ups ($p < 0.01$), flexed arm hang ($p < 0.05$) and 50 metre run ($p < 0.001$). The 'DPE2' girls were superior to the 'Normal P.E.' girls, at the same stage, in sit ups

Source	Shuttle Run df	Shuttle Run ms	Shuttle Run F	S. Long Jump df	S. Long Jump ms	S. Long Jump F	Sit ups df	Sit ups ms	Sit ups F
Group	1	1.12	***30.23	1	0.03	1.72	1	408	*6.46
Sex	1	0.22	*5.86	1	0.14	**8.48	1	348	*5.52
Group x Sex	1	0.01	0.36	1	0.07	*4.08	1	33	0.52
Residual	104	0.04		105	0.02		106	63	
Total	107	0.05		108	0.02		109	70	

Source	Flex. Arm Hang df	Flex. Arm Hang ms	Flex. Arm Hang F	50 Metre Run df	50 Metre Run ms	50 Metre Run F	Endurance Run df	Endurance Run ms	Endurance Run F
Group	1	896	*5.14	1	7.61	***79.91	1	0.70	*6.71
Sex	1	39.5	0.23	1	0.02	0.20	1	0.03	0.26
Group x Sex	1	264	1.51	1	0.05	0.56	1	0.01	0.13
Residual	104	175		103	0.10		102	0.10	
Total	107	181		106	0.17		105	0.11	

*** $p<0.001$ ** $p<0.01$ * $p<0.05$

Table 5.21 Analysis of variance using 'change' scores of CAHPER Fitness-Performance II Test.

	Shuttle Run ♂	Shuttle Run ♀	Shuttle Run Both	S.Long Jump ♂	S.Long Jump ♀	S.Long Jump Both	Sit ups ♂	Sit ups ♀	Sit ups Both
'DPE2'	0.10	0.21	0.15	0.07	0.09	0.08	-1.72	3.10	0.11
n	30	21	51	32	20	52	33	20	53
'Normal P.E.'	-0.09	-0.02	-0.05	-0.01	0.11	0.05	3.14	5.71	4.40
n	29	28	57	29	28	57	29	28	57

	Flex. Arm Hang ♂	Flex. Arm Hang ♀	Flex. Arm Hang Both	50 Metre Run ♂	50 Metre Run ♀	50 Metre Run Both	Endurance Run ♂	Endurance Run ♀	Endurance Run Both
'DPE2'	11.40	6.96	9.69	0.32	0.40	0.35	0.17	0.18	0.18
n	33	21	54	30	21	51	31	19	50
'Normal P.E.'	2.76	4.62	3.72	-0.17	-0.19	-0.18	-0.01	0.04	0.02
n	26	28	54	28	28	56	27	29	56

Table 5.22 Group mean 'change' scores of CAHPER Fitness-Performance II Test.

(p<0.001), flexed arm hang (p<0.05) and 50 metre run (p<0.001).

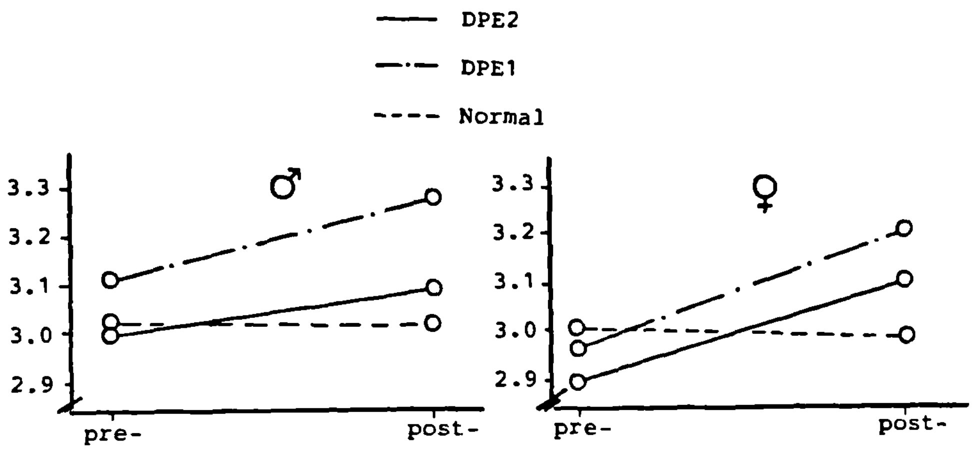
A two-way analysis of variance using the 'change' scores of 'DPE2' and 'Normal P.E.' (table 5.21) showed significant differences between the groups on shuttle run (p<0.001), sit ups (p < 0.05), flexed arm hang (p<0.05), 50 metre run (p<0.001) and endurance run (p<0.05). The 'DPE2' group had greater improvement on shuttle run, flexed arm hang, 50 metre run and endurance run.

The 'Normal P.E.' group improved more markedly on sit ups than the 'DPE2' group (table 5.22). The girls made a significantly greater improvement (p<0.05) than the boys on shuttle run and sit ups (tables 5.21, 5.23). The analysis of variance also indicated a group by sex interaction (p<0.05) on standing long jump. Table 5.22 showed that, on this item, the 'Normal P.E.' boys had regressed over the year while the 'Normal P.E.' girls had improved most of all. There was little difference in 'change' scores between the 'DPE2' boys and girls.

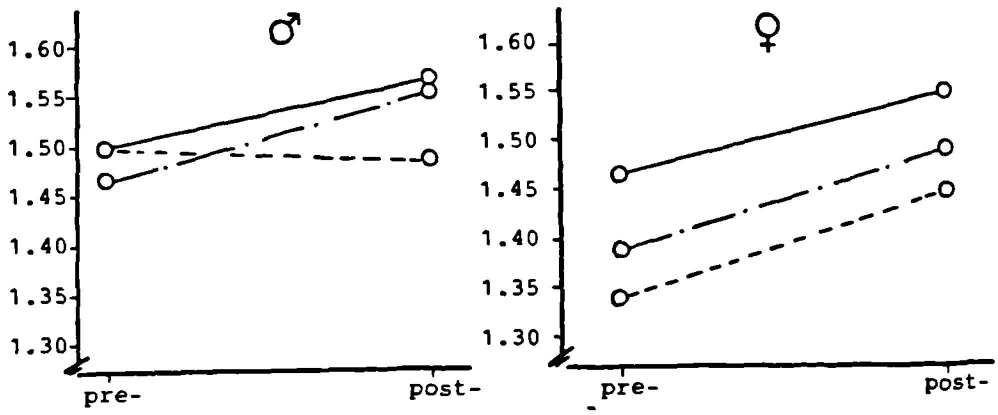
	Shuttle Run		St. Long Jump		Sit ups	
Sex	♂	♀	♂	♀	♂	♀
'change'	0.01	0.08	0.03	0.10	0.6	4.6
n	59	49	61	48	62	48

	F. Arm Hang		50 M. Run		Endur. Run	
Sex	♂	♀	♂	♀	♂	♀
'change'	7.6	5.6	0.08	0.06	0.09	0.10
n	59	49	58	49	58	48

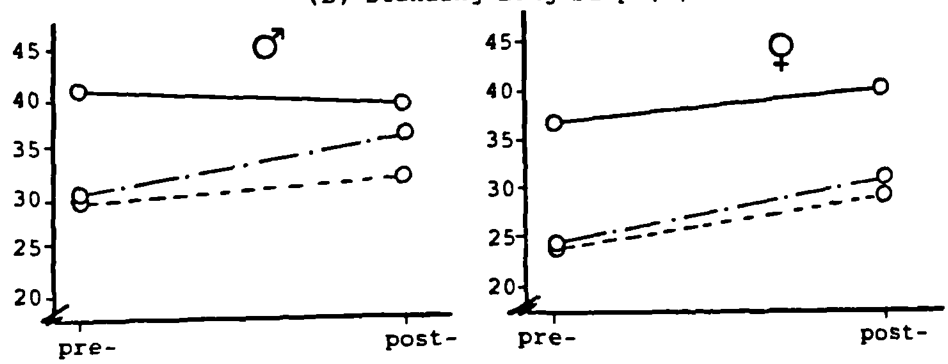
Table 5.23 'Change' scores for sex on CAHPER Fitness-Performance II Test.



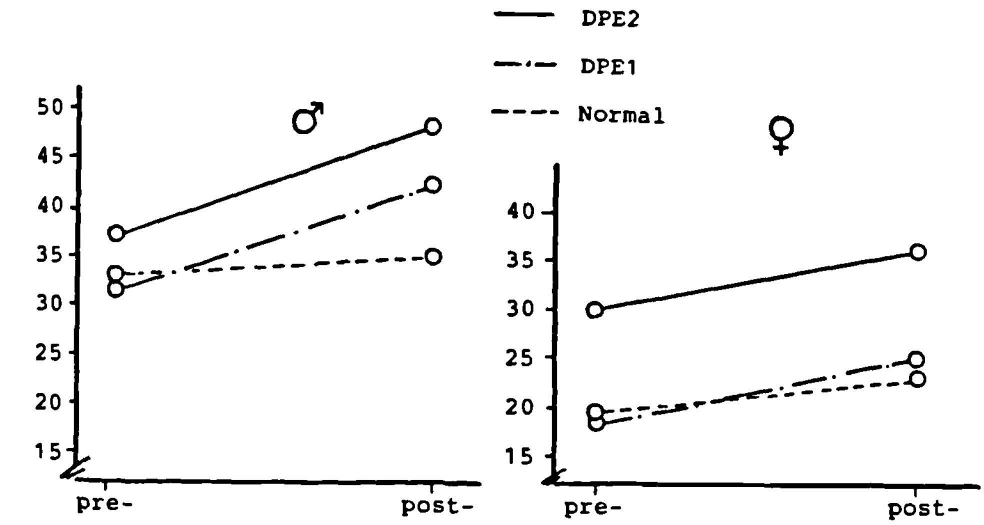
(a) Shuttle Run (m/s)



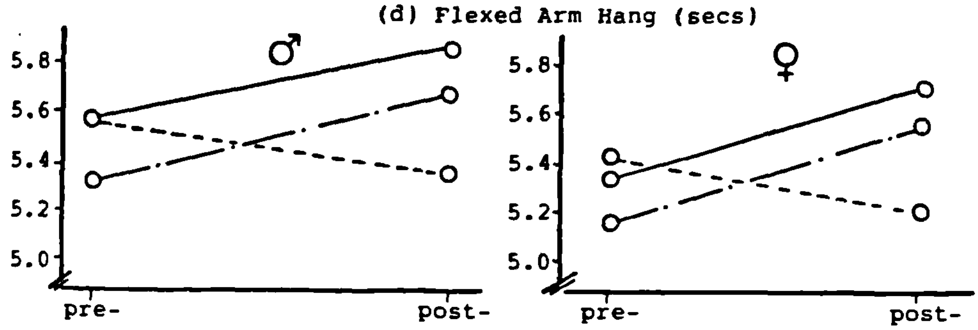
(b) Standing Long Jump (m)



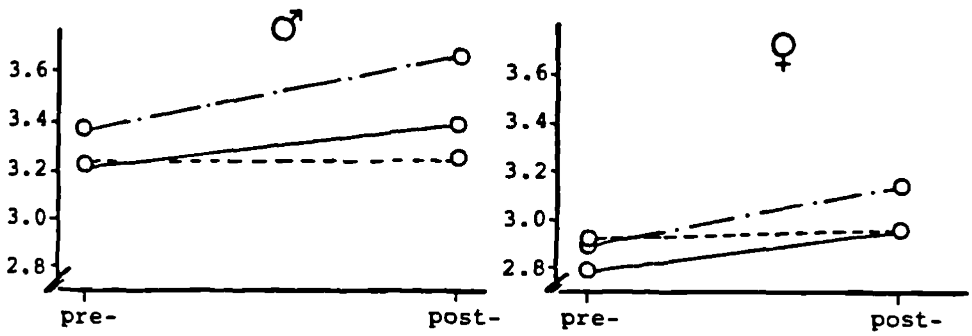
(c) Sit ups



(d) Flexed Arm Hang (secs)



(e) 50 Metre Run (m/s)



(f) Endurance Run (m/s)

Figure 5.3 (a-f) Mean differences from pre- to post-programme on CAHPER Fitness-Performance II Test.

Although Model 3 was concerned with 'DPE2' and 'Normal P.E.', the 'Daily P.E.' group of model 2 ('DPE1') was included in the initial examination of the mean scores, for comparative purposes (figures 5.3.a-f).

'DPE2' were superior, at the pre-programme stage, to both other groups on standing long jump, sit ups, flexed arm hang, for boys and girls; and in 50 metre run for boys. 'DPE2' were lowest, at the same stage, in shuttle run for boys and girls, and in endurance run for boys and girls.

With the exception of endurance run the post-programme mean scores followed the same pattern for boys and girls. Although the 'Normal P.E.' girls were superior to the 'DPE2' girls on endurance run, the 'DPE2' group were superior to the 'Normal P.E.' group on all other items for boys and for girls. The 'DPE2' boys and girls had superior post-programme mean scores to the 'DPE1' group on standing long jump, sit ups, flexed arm hang and 50 metre run.

A two-tailed t-test was used on the summed 'T' scores from the CAHPER Fitness-Performance II battery at pre- and post-programme. Although the 'DPE2' boys had a superior pre-programme mean total to the 'Normal P.E.' boys there was no difference between the two groups of boys at the 0.05 level of

Boys	'DPE2'		'Normal P.E.'			
Post-programme	mean	sd	mean	sd	t	p
	52.80	9.89	46.31	9.09	2.40	0.02
n	29		22			

Table 5.24 Two-tailed t -test on summed 'T' scores of CAHPER Fitness-Performance II test (boys).

Girls	'DPE2'		'Normal P.E.'			
Pre-programme	mean	sd	mean	sd	t	p
	56.44	9.75	45.94	7.92	3.92	0.000
n	21		28			
Post-programme	55.84	10.94	46.30	7.44	3.44	0.001
n	21		28			

Table 5.25 Two-tailed t -test on summed 'T' scores of CAHPER Fitness-Performance II test (girls).

Boys	'DPE2'		'Normal P.E.'			
	mean	sd	mean	sd	t	p
Pre-programme	20.07	5.08	16.48	5.30	2.58	0.013
n	27		29			
Post-programme	18.96	3.63	16.55	6.28	1.77	0.083
n	27		29			
Girls						
Pre-programme	24.00	4.58	23.07	6.02	0.59	0.555
n	21		29			
Post-programme	22.50	4.79	22.59	6.64	0.04	0.971
n	21		29			

Table 5.26 Mean scores and two-tailed t -test on Flexibility.

significance. However, there was a significant difference ($p<0.05$) at post-programme testing when the 'DPE2' boys had improved their total score and the 'Normal P.E.' boys had regressed (table 5.24). Although the 'DPE2' girls had regressed slightly in their total at re-test, while the 'Normal P.E.' girls had increased slightly over the same period, the 'DPE2' girls had significantly superior pre- ($p<0.001$) and post-programme ($p<0.001$) mean total CAHPER scores to the 'Normal P.E.' girls (table 5.25).

The two-way analysis of variance, using the 'change' scores of flexibility, indicated no significant group difference, sex difference, or group by sex interaction, between the 'DPE2' and 'Normal P.E.' groups in this item.

The two-tailed t-test (table 5.26) indicated that there was a significant difference at pre-programme testing between the two groups of boys, with the 'DPE2' boys superior to the 'Normal P.E.' boys ($p < 0.05$). However, there was no difference at pre-programme testing between the two groups of girls, nor at post-programme testing between the two groups of boys and between the two groups of girls.

Although the 'DPE2' boys and girls had superior pre-programme mean flexibility scores to the boys and girls of the 'Normal P.E.' group (table 5.26), only the 'Normal P.E.' boys improved over the year. The 'DPE2' group regressed more than the 'Normal P.E.' group. The girls had superior mean scores than the boys at pre- and post-programme testing.

All pre-programme testing in motor fitness was conducted in August, after the summer vacation, and the post-programme testing in June, at the conclusion of the same school year. The scores from tables 5.19 and 5.26 would suggest that there may have been some carry-over by the 'DPE2' girls on standing long jump, sit ups and flexed arm hang. It could be said that these activities test aspects of motor fitness uncommon to girls and the differences are likely to have been the result of the intervention programme. The same argument could be presented for the significant differences between the two groups of boys on sit ups and flexibility. With these exceptions there was considerable homogeneity between the groups in Models 2 and 3 at the pre-programme stages; 'DPE2', 'DPE1' and 'Normal P.E.'. The scores of the children in all groups appear to be influenced by the summer vacation.

From examination of Figures 5.3.a-f it could be seen that at post-programme testing, with the exception of shuttle run and endurance run, the 'DPE2' boys were superior to the other two groups. In these two items the 'DPE1' boys were superior to the others. The 'Normal P.E.' boys were inferior to the 'Daily

P.E.' groups of boys on all items. With the exception of shuttle run and endurance run, the 'DPE2' girls were superior on all items. The 'DPE1' girls were superior on shuttle run and endurance run. The 'Normal P.E.' girls were superior in flexibility to the other two groups and superior to the 'DPE2' girls on endurance run. In all other items the 'Normal P.E.' girls were inferior to the other two groups.

These results would seem to suggest that the 'Daily P.E.' groups were superior to the 'Normal P.E.' group on the motor fitness battery and that the 'DPE2' children were superior to the 'DPE1' children on the majority of items.

Chapter 6.

Linwood Project - Analysis of Academic Results.

Introduction.

The fundamental purpose of this particular aspect of the research was to establish whether there were changes in academic performance by the children, in the test items, over the year. The two test items were the Staffordshire Test of Computation and the Gapadol Test of Reading Comprehension.

Every child in this study (chapter 3.2) was required to have a pre-programme and post-programme score. If either of the scores did not exist on a particular item then the child was excluded from any computation involving that item.

The three statistical tests described in the introduction to Motor Fitness (chapter 5) were used in analyses of academic results.

Boys

	'Daily P.E.'		'Normal P.E.'	
	mean	sd	mean	sd
Pre-	102.2	16.8	106.7	14.4
Post-	107.6	15.4	111.2	12.3
n	107		41	

Girls

	'Daily P.E.'		'Normal P.E.'	
	mean	sd	mean	sd
Pre-	103.0	14.2	106.3	14.6
Post-	109.4	12.3	111.7	10.9
n	91		30	

Table 6.1 Mean arithmetic quotients and standard deviations.

	'Daily P.E.'			'Normal P.E.'		
	Boys	Girls	Both	Boys	Girls	Both
'Change'	5.4	6.4	5.8	4.5	5.4	4.9
Number	107	91	198	41	30	71

Table 6.2 Mean 'change' scores of arithmetic quotients.

Staffordshire Test of Computation.

6.1 Model 1.

Each child undertook the Staffordshire Test of Computation in June at the end of the session preceding the programme and in June at the completion of the programme, one calendar year later. From the raw data each score was translated into an arithmetic quotient using the Staffordshire Test of Computation Manual (Hebron and Pattinson, 1974). Each child had a pre-programme and a post-programme arithmetic quotient. The mean arithmetic quotient and standard deviation were calculated for each group ('Daily P.E.' and 'Normal P.E.') and sex (table 6.1).

While the 'Daily P.E.' boys had shown a greater improvement pattern, the 'Normal P.E.' boys had higher mean pre- and post-programme quotients than the 'Daily P.E.' boys. The girls showed a similar pattern to the boys. The 'Daily P.E.' boys and girls had closed the gap on the respective sexes of the 'Normal P.E.' group (table 6.2).

While all groups had improved the girls had superior arithmetic quotient scores to the boys.

A two-way analysis of variance was conducted using the 'change' scores. There was neither a group,

		Boys			
		'Daily'		'Normal'	
A.Q.	Description	Pre-	Post-	Pre-	Post-
89-	'Retarded'	23%	16%	12%	7%
90-119	'Normal'	59%	62%	68%	71%
120+	'Superior'	18%	22%	20%	22%
n		107		41	

		Girls			
		'Daily'		'Normal'	
A.Q.	Description	Pre-	Post-	Pre-	Post-
89-	'Retarded'	19%	4%	7%	7%
90-119	'Normal'	74%	76%	67%	63%
120+	'Superior'	8%	20%	27%	30%
n		91		30	

Table 6.3 Arithmetic quotient divisions.

nor a sex difference, nor an interaction effect, at the 0.05 level of significance.

To establish whether there were differences between the two groups of boys and between the two groups of girls, before and after the programme, a two-tailed t-test was used. There were no differences, at the 0.05 level of significance, on either the pre- or the post-programme tests.

As in the 'Pilot Study', it was of value to examine the distribution of scores (Table 6.3). Using 100 as the mean arithmetic quotient (Hebron and Pattinson, 1974) the following divisions were devised to clarify the relative distributions:

less than 90 - retarded arithmetically,

90-119 - range of normal achievement arithmetically,

120 or more - superior arithmetic ability.

The arithmetic quotients were calculated for each child. Any child who had an arithmetical age within two years of his/her chronological age was considered to be within the range of 'normal' achievement arithmetically. If the child had an arithmetic age beyond two years of his/her chronological age this was considered to be 'superior' in arithmetic ability. Similarly any child who had an arithmetic age two years below his/her chronological age was considered to be in the 'retarded' arithmetical category.

A large percentage of the 'Daily P.E.' boys (23%) were in the pre-programme 'retarded' category (table 6.3). This percentage dropped to 16% in the post-programme testing. The improvement was reflected in the other two categories where the increases were by 3% in the 'normal' and by 4% in the 'superior' categories. A similar relative improvement was recorded in the 'Normal P.E.' boys' progress. Both groups of boys had 22% in the 'superior' category at the end of the programme.

The 'Daily P.E.' girls had reduced the percentage of children in the 'retarded' category from 19% to 4% while the 'Normal P.E.' girls had remained constant at 7%. The 'Daily P.E.' girls had improved in the 'superior' category from 8% to 20% over the year, but still fell behind the 'Normal P.E.' girls (30%).

One factor which may have influenced the distributions was the socio-economic background of one of the schools (school F) in the 'Normal P.E.' group. In order to investigate whether socio-economic background was a factor, the 'Normal P.E.' group were sub-divided. The children from the higher socio-economic group were withdrawn from the 'Normal P.E.' group. The remaining children, from the same socio-economic background as the 'Daily P.E.'

		Boys			
		'Daily'		'Rednor'	
A.Q.	Description	Pre-	Post-	Pre-	Post-
89-	'Retarded'	23%	16%	20%	12%
90-119	'Normal'	59%	62%	72%	80%
120+	'Superior'	18%	22%	8%	8%
n		107		25	

		Girls			
		'Daily'		'Rednor'	
A.Q.	Description	Pre-	Post-	Pre-	Post-
89-	'Retarded'	19%	4%	9%	9%
90-119	'Normal'	74%	76%	82%	77%
120+	'Superior'	8%	20%	9%	14%
n		91		22	

Table 6.4 Arithmetic quotient divisions.

children, were retained and referred to as the 'Reduced Normal P.E.' group (Rednor).

Using the same criteria as in table 6.3, table 6.4 was constructed to examine the distribution of the two groups, 'Daily P.E.' and 'Reduced Normal P.E.'(Rednor).

Although the 'Daily P.E.' group had a higher percentage of boys in the 'retarded' category than the 'Rednor' group, before and after the programme, they also had an increased percentage in the 'normal' category from pre- to post-programme. The 'Rednor' group had maintained the same percentage of boys in the 'superior' category while the 'Daily P.E.' boys had a greater percentage at pre-programme and an increased percentage at post-programme. From pre- to post-programme the 'Daily P.E.' girls had a considerably reduced percentage in the 'retarded' category while the 'Rednor' girls remained constant and at a higher level. Although both groups of girls had improved percentages in the 'superior' category the 'Daily P.E.' girls had shown greater percentage increase.

Table 6.4 suggested that there was a trend of greater improvement by the 'Daily P.E.' group over the 'Rednor' group from test to re-test.

To examine the data in more detail a two-way analysis of variance using 'change' scores was carried out. There was no difference between the 'Daily P.E.' group and the 'Rednor' group at the 0.05 level of significance.

Similarly using the two-tailed t-test there were no differences, at the 0.05 level of significance, between the 'Daily P.E.' boys and girls, and the 'Rednor' boys and girls at pre- and at post-programme.

In Model 1 it could be claimed that, in the Staffordshire Test of Computation, before and after the programme, there was no significant difference detected between the 'Daily P.E.' group and the children engaged in 'normal' physical education, regardless of the inclusion or exclusion of the children from the higher socio-economic background. While this would appear to conflict with the results of the Pilot Study and require explanation, cross-model comparisons and discussion of results will be dealt with in chapters 8 and 10.

Boys

	'Daily P.E.'		'Normal P.E.'	
	mean	sd	mean	sd
Pre-	107.4	13.8	114.1	17.3
Post-	110.0	12.7	112.8	16.7
n	81		22	

Girls

	'Daily P.E.'		'Normal P.E.'	
	mean	sd	mean	sd
Pre-	108.2	13.2	117.2	11.8
Post-	110.0	12.7	113.9	10.6
n	78		19	

Table 6.5 Mean arithmetic quotients and standard deviations.

Source	df	ms	F
group	1	686.6	13.1***
sex	1	22.8	0.4
group x sex	1	22.2	0.4
residual	196	52.4	
total	199	55.2	

*** $p < 0.001$

Table 6.6 Analysis of Variance using 'change' scores of arithmetic quotients.

	Boys	Girls	Both
'Daily'	2.5	2.2	2.4
n	81	78	159
'Normal'	-1.3	-3.3	-2.2
n	22	19	41

Table 6.7 Mean 'change' scores of arithmetic quotients.

6.2 Model 2.

Similar to the academic analysis of Model 1, the children in primary 7 who were experiencing daily physical education for the first time, were analysed together with the primary 7 children, who were undertaking the 'normal' physical education programmes. These groups, 'Daily P.E.' and 'Normal P.E.', combined to form Model 2. The same analyses carried out in Model 1 were used in Model 2.

Although the 'Normal P.E.' children had higher mean scores than the 'Daily P.E.' children, the boys and girls of the 'Normal P.E.' group regressed in mean scores over the year (table 6.5). The boys and girls of the 'Daily P.E.' group had improved their mean scores from pre- to post-programme testing.

To examine the differences over the year a two-way analysis of variance was conducted using the 'change' scores of the two groups, 'Daily P.E.' and 'Normal P.E.'. The 'Daily P.E.' group made greater improvement ($p<0.001$) than the 'Normal P.E.' children in the Staffordshire Test of Computation (tables 6.6, 6.7).

As previously mentioned in Model 1, the 'change' scores could disguise the start and finish scores of the children. This could be seen in tables

Girls

	'Daily P.E.'		'Normal P.E.'			
	mean	sd	mean	sd	t	p
Pre-	108.2	13.15	117.2	11.84	2.71	0.008
Post-	110.4	12.66	113.9	10.60	1.11	0.269
n	78		19			

Table 6.8 Two-tailed t -test of arithmetic quotients.

Boys

		'Daily'		'Normal'	
A.Q.	Description	Pre-	Post-	Pre-	Post-
89-	'Retarded'	11%	6%	14%	14%
90-119	'Normal'	70%	69%	41%	41%
120+	'Superior'	19%	25%	45%	45%
n		81		22	

Girls

		'Daily'		'Normal'	
A.Q.	Description	Pre-	Post-	Pre-	Post-
89-	'Retarded'	10%	4%	0%	5%
90-119	'Normal'	67%	72%	63%	68%
120+	'Superior'	23%	24%	37%	26%
n		78		19	

Table 6.9 Arithmetic quotient divisions.

6.5 and 6.7 where, in isolation, the figures could have been misleading.

Using the two-tailed t-test the 'Normal P.E.' girls were superior ($p<0.01$) to the 'Daily P.E.' girls in the pre-programme testing (table 6.8), but there was no significant difference between the two groups of girls at the post-programme stage. There were no differences between the two groups of boys, either at pre- or post-programme testing.

Similar to the Pilot Study (Chapter 4.2) and Model 1 (Chapter 6.1) the pre- and post-programme arithmetic quotients were classified (table 6.9) into three divisions:

less than 90 - 'retarded' arithmetically

90-119 - range of 'normal' achievement arithmetically

120 or more - 'superior' arithmetic achievement.

The boys and girls of the 'Daily P.E.' group had reduced percentages in the 'retarded' category from pre- to post-programme testing. While the 'Normal P.E.' boys had remained constant, the 'Normal P.E.' girls had an increased percentage in the 'retarded' category.

The 'Normal P.E.' boys had a higher percentage of scores in the 'superior' category than the other groups. The 'Daily P.E.' boys and girls both showed increased percentages in the 'superior' category, while the 'Normal P.E.' girls had a reduced

Boys

A.Q.	Description	'Daily' Pre-	'Daily' Post-	'Rednor' Pre-	'Rednor' Post-
89-	'Retarded'	11%	6%	15%	15%
90-119	'Normal'	70%	69%	62%	46%
120+	'Superior'	19%	25%	23%	38%
Mean		107.4	110.0	110.5	111.0
n		81		13	

Girls

A.Q.	Description	'Daily' Pre-	'Daily' Post-	'Rednor' Pre-	'Rednor' Post-
89-	'Retarded'	10%	4%	0%	8%
90-119	'Normal'	67%	72%	62%	69%
120+	'Superior'	23%	24%	38%	23%
Mean		108.2	110.4	117.7	113.2
n		78		13	

Table 6.10   Arithmetic quotient divisions and mean scores.

percentage in this category. The trend for the 'Daily P.E.' boys and girls was upward, while the 'Normal P.E.' boys remained constant and the girls regressed.

As identified in Model 1, there was a socio-economic division within the 'Normal P.E.' group. In keeping with the analyses conducted in Model 1, the 'Normal P.E.' group was reduced to the 'Rednor' group and the two groups from the similar socio-economic background, 'Daily P.E.' and 'Rednor', were compared over the year.

The divisions described in Model 1 were constructed using the pre- and post-programme group arithmetic quotients of the 'Daily P.E.' and 'Rednor' groups (table 6.10). This table indicated the percentage distribution of the arithmetic quotients into the three divisions.

Although the 'Rednor' girls regressed in arithmetic quotients and the 'Daily P.E.' girls and boys improved over the year, the former group still had superior pre- and post-programme mean arithmetic quotients. The 'Rednor' boys had a superior pre-programme mean score to the 'Daily P.E.' boys, but the latter group improved at a greater rate and the two post-programme mean scores were similar.

The 'Daily P.E.' group had a decreased percentage of boys and girls in the 'retarded' category. In the 'retarded' category the 'Rednor'

Source	df	ms	F
group	1	426.3	8.11**
sex	1	46.6	0.89
group x sex	1	125.4	2.39
residual	181	52.6	
total	199	55.0	

** $p < 0.01$

Table 6.11 Analysis of Variance using 'change' scores of arithmetic quotients.

	'Daily'	'Rednor'
'Change'	2.38	-2.00
Number	159	26

Table 6.12 Group mean 'change' scores of arithmetic quotients.

group maintained the same percentage of boys and had an increased percentage of girls. The 'Rednor' girls also had the highest percentage in the 'superior' category at the pre-programme testing but this was reduced in the post-programme test to the lowest. The other three sub-groups increased their percentages.

On completion of the programme the number of 'Daily P.E.' children, boys and girls, who were classified in the arithmetically 'retarded' group, was reduced to lower percentages than the 'Normal P.E.' groups, regardless of socio-economic background or sex.

In table 6.10 the 'Daily P.E.' group showed greater mean 'change' than the 'Rednor' group on completion of the year. A two-way analysis of variance, using the 'change' scores (tables 6.11, 6.12) confirmed that there was a difference ($p<0.01$) and that the 'Daily P.E.' group had improved while the 'Rednor' group had regressed.

A two-tailed t-test was used on the pre- and post-programme scores of the boys and girls of the 'Daily P.E.' and 'Rednor' groups. There were no differences, at the 0.05 level of significance, between the two groups of boys at pre- and at post-programme. Although the 'Rednor' girls were

Girls

	'Daily P.E.'		'Rednor'			
	mean	sd	mean	sd	t	p
Pre-	108.2	13.15	117.7	11.56	2.45	0.016
Post-	110.4	12.66	113.2	11.2	0.74	0.462
n	78		13			

Table 6.13 Two-tailed t -test of arithmetic quotients.

superior to the 'Daily P.E.' girls at pre-programme ($p < 0.05$), there was no difference at post-programme testing (table 6.13).

Although there were no significant differences between the two groups, 'Daily P.E.' and 'Normal P.E.' at post-programme testing, it would appear that the 'Daily P.E.' group had improved from pre- to post-programme in arithmetic quotients and could be considered to have gained on the 'Normal P.E.' group regardless of socio-economic background.

Boys

	'DPE2'		'Normal P.E.'	
	mean	sd	mean	sd
Pre-	107.2	16.5	114.1	17.3
Post-	113.8	15.2	112.8	16.7
n	31		22	

Girls

	'DPE2'		'Normal P.E.'	
	mean	sd	mean	sd
Pre-	108.3	14.1	117.2	11.8
Post-	117.1	11.1	113.9	10.6
n	22		19	

Table 6.14 Mean arithmetic quotients and standard deviations.

Source	df	ms	F
group	1	2204.3	37.6***
sex	1	2.3	0.04
group x sex	1	97.1	1.65
residual	90	58.7	
total	93	55.2	

*** $p < 0.001$

Table 6.15 Analysis of variance using 'change' scores of arithmetic quotients.

	'DPE2'	'Normal'
'Change'	7.57	-2.20
Number	53	41

Table 6.16 Mean 'change' scores of arithmetic quotients.

6.3 Model 3

To examine the influence of an extended programme of daily physical education on academic performance, the children engaged in a second year of daily physical education ('DPE2') were monitored and the results were analysed. The results from the 'DPE2' children were compared with the children at the same stage (primary 7) in the 'Normal P.E.' group from Model 2.

The boys and girls of the 'Normal P.E.' group had superior pre-programme mean arithmetic scores to the boys and girls of 'DPE2' (table 6.14).

The positions were reversed in post-programme testing with the 'DPE2' group superior to the 'Normal P.E.' group, boys and girls. The 'DPE2' boys and girls had increased mean arithmetic quotients at post-programme testing, while the 'Normal P.E.' group, boys and girls, regressed over the same period.

Using 'change' scores the differences between the groups was examined with a two-way analysis of variance. There was a difference at the 0.001 level of significance (table 6.15).

The 'DPE2' group had made an improvement and the 'Normal P.E.' group had regressed (table 6.16).

Girls

	'DPE2'		'Normal P.E.'			
	mean	sd	mean	sd	t	p
Pre-	108.3	14.13	117.2	11.84	2.15	0.038
Post-	117.1	11.15	113.9	10.60	0.95	0.348
n	22		19			

Table 6.17 Two-tailed t -test of arithmetic quotients.

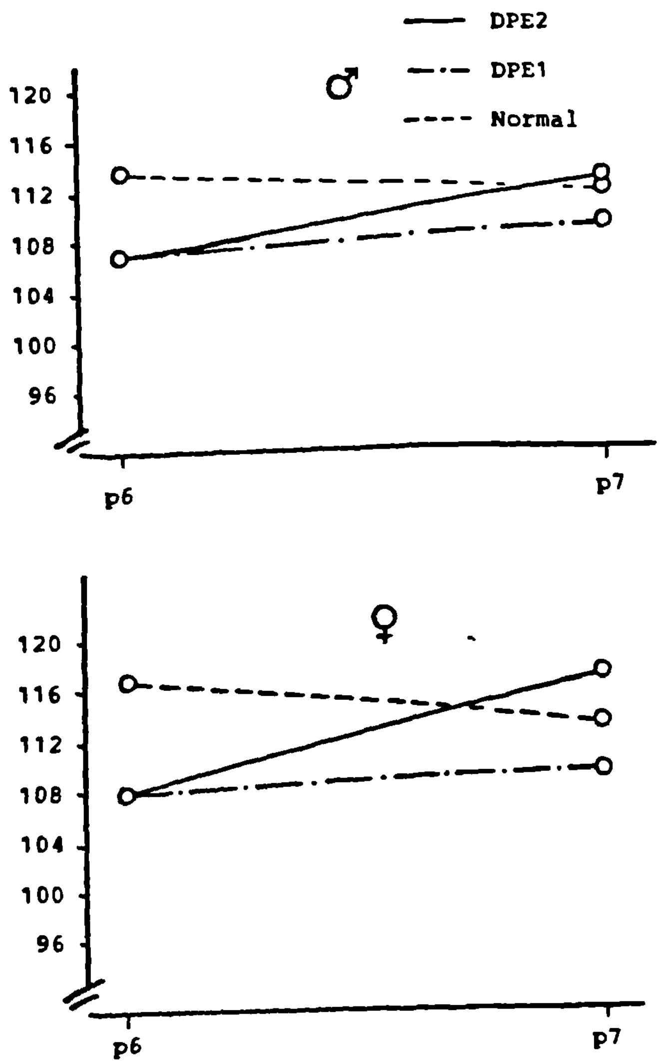


Figure 6.1 Mean arithmetic quotients.

Using the two-tailed t-test the 'Normal P.E.' girls were found to be superior ($p<0.05$) to the 'Daily P.E.' girls in the pre-programme testing (table 6.17), but there was no significant difference at post-programme. There were no differences between the two groups of boys, either at pre- or post-programme testing.

The 'DPE2' group and the children on daily physical education for one year ('DPE1') in Model 2 have been compared to determine any effects between one year and two years on the daily physical education programme.

It could be seen from figure 6.1 that, although 'DPE2' and 'DPE1' were independent of each other, they had similar mean arithmetic quotients at the pre-programme testing. Both 'DPE1' and 'DPE2' groups had increased mean arithmetic quotients at the completion of primary 7. Although there were differences in mean scores at the pre-programme test, between the 'DPE' groups and the 'Normal P.E.' group, girls in particular (Tables 6.8, 6.17), they came closer together at post-programme testing in Primary 7.

In previous analyses, in this chapter (6.1, 6.2) the higher socio-economic group was identified as influencing the 'Normal P.E.' group scores. By removing the higher socio-economic group from the

	Boys				Girls			
	'Daily P.E.'		'Rednor'		'Daily P.E.'		'Rednor'	
	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-
mean	107.2	113.8	110.5	111.0	108.3	117.1	117.7	113.2
sd	16.5	15.2	17.1	17.7	14.1	11.1	11.6	11.1
n	31		13		22		13	

Table 6.18 Mean and standard deviations of arithmetic quotients.

		Boys			
		'Daily'		'Rednor'	
A.Q.	Description	Pre-	Post-	Pre-	Post-
89-	'Retarded'	16%	7%	15%	15%
90-119	'Normal'	54%	52%	62%	46%
120+	'Superior'	29%	42%	23%	38%
mean		107.2	113.8	110.5	111.0
n		31		13	

		Girls			
		'Daily'		'Rednor'	
A.Q.	Description	Pre-	Post-	Pre-	Post-
89-	'Retarded'	5%	0%	0%	0%
90-119	'Normal'	73%	50%	62%	77%
120+	'Superior'	23%	50%	38%	23%
mean		108.3	117.1	117.7	113.2
n		22		13	

Table 6.19 Percentage distributions and mean scores of arithmetic quotients.

'Normal P.E.' group it was possible to compare the two groups from similar background ('Daily P.E.' and 'Rednor'). The percentage distribution table was used to study the relative positions of the two groups in terms of the arithmetical categories (table 6.18, 6.19).

The pre-programme percentages indicated that the 'Rednor' group had a lower percentage in the 'retarded' category, and a higher percentage of girls in the 'superior', than the 'DPE2' group. However, on re-test the 'DPE2' group had a lower percentage in the 'retarded' category for boys than the 'Rednor' group, and consideraby greater percentage in the 'superior' category than the 'Rednor' group for girls and boys.

At pre-programme testing the 'Rednor' boys and girls had superior mean scores than the 'DPE2' boys and girls. At the completion of the programme, the 'DPE2' group, boys and girls, had increased mean arithmetic quotients and were superior to the 'Rednor' group, boys and girls. The 'Rednor' girls had regressed over the year. The improvement by the 'DPE2' group was reflected across the ability divisions from 'retarded' to 'superior'.

A two-way analysis of variance, using the 'change' scores of arithmetic quotients, showed that the 'DPE2' group were superior to the 'Rednor' group

Source	df	ms	F
group	1	1578.0	26.1***
sex	1	1.54	0.03
group x sex	1	225.0	3.72
residual	75	60.4	
total	78	81.5	

*** $p < 0.001$

Table 6.20 Analysis of variance using 'change' scores of arithmetic quotients.

	'DPE2'	'Rednor'
'Change'	7.57	-2.00
Number	53	26

Table 6.21 Mean 'change' scores of arithmetic quotients.

at the 0.001 level of significance (tables 6.20, 6.21).

Using the two-tailed t-test, on the arithmetic quotients, there were no significant differences at pre- and post-programme testing, between the boys, nor between the girls, of the two groups ('DPE2' and 'Rednor').

Regardless of differences within the 'Normal P.E.' group it appeared, from the analyses of arithmetic quotients, that the children on the daily physical education programme for two years had not fallen behind the 'Normal P.E.' children. Indeed it could be said that they had shown greater improvement than the 'Normal P.E.' group.

Boys

	'Daily P.E.'		'Normal P.E.'	
	mean	sd	mean	sd
Pre-	10.45	1.37	10.71	1.55
Post-	11.53	2.40	11.97	2.30
'change'	1.08		1.26	
n	116		42	

Girls

	'Daily P.E.'		'Normal P.E.'	
	mean	sd	mean	sd
Pre-	10.63	1.57	10.69	1.50
Post-	11.55	2.25	12.16	2.41
'change'	0.92		1.47	
n	99		31	

Table 6.22 Mean reading age scores, standard deviations and mean 'change' scores.

Gapadol Test of Reading Comprehension.

6.4 Model 1.

Each child undertook the Gapadol Test of Reading Comprehension in June, at the end of the session preceding the start of the programme, and in June at the completion of the programme, one calendar year later. The raw score for each child was converted into a Reading Comprehension Age using norms from the Gapadol Test of Reading Comprehension Manual (McLeod and Anderson, 1972). Table 6.22 displayed the group mean scores in reading age for boys and girls.

There were differences in the mean scores between the groups and the sexes with the 'Normal P.E.' group exceeding the score of the 'Daily P.E.' group in both test and re-test measurements. The 'Normal P.E.' group also had superior mean 'change' measurements than the 'Daily P.E.' group, boys and girls (table 6.22).

To measure the extent to which this improvement was reflected throughout the groups and sexes a two-way analysis of variance was computed. There was neither a group nor a sex difference, nor an interaction effect at the 0.05 level of significance.

Boys

Description	'Daily' Pre-	'Daily' Post-	'Normal' Pre-	'Normal' Post-
'Retarded'	4%	14%	2%	7%
'Normal'	81%	70%	71%	72%
'Superior'	15%	16%	26%	21%
Number	116		42	

Girls

Description	'Daily' Pre-	'Daily' Post-	'Normal' Pre-	'Normal' Post-
'Retarded'	19%	4%	7%	7%
'Normal'	74%	76%	67%	63%
'Superior'	8%	20%	27%	30%
Number	99		31	

Table 6.23   Reading age divisions.

To establish whether there were differences between the two groups of boys and between the two groups of girls, before and after the programme, a two-tailed t-test was used. There were no differences on either the pre- or post-programme tests at the 0.05 level of significance.

Despite the inferences of table 6.22, suggesting that there could be differences between the two groups, the two statistical tests (analysis of variance and t-test) supported the null hypothesis.

As in the analysis of the Staffordshire Test of Computation it was possible to re-examine the scores from the Gapadol Test in terms of percentage distribution. The evaluation criteria of reading achievement is set out in the Manual of Gapadol Reading Comprehension (McLeod and Anderson, 1972, p8). Scores were divided into three categories. A child whose score fell into the bottom 10% of his age group, according to the Manual norms, was considered to be 'reading retarded'. A child with a score in the top 10% of his age group was considered to have had 'superior reading ability' (table 6.23).

At the pre-programmme stage there was a higher percentage of children from the 'Daily P.E.' group in the 'retarded' category and a higher percentage of 'Normal P.E.' children in the 'superior' category. At pre-programme there was a higher percentage of girls in the 'retarded' category than boys, and there was a higher percentage of boys than girls from the 'Daily P.E.' group in the 'superior' category. At post-programme testing the percentages of 'Daily P.E.' boys and both groups of girls increased in the 'superior' category whereas the percentage of 'Normal P.E.' boys decreased. There was a considerable drop in the percentage of 'Daily P.E.' girls in the 'retarded' category at the post-programme testing. Although the 'Normal P.E.' girls had a consistent percentage in the 'retarded' category, pre- and post-programme, both sets of boys had increased percentages in that category.

At the end of the programme there were 10 boys and 6 girls (7%) in the 'Daily P.E.' group who recorded a Gapadol 'ceiling' reading age of 16 years and 10 months. In the 'Normal P.E.' group there were 2 boys and 1 girl (4%) who reached the same level. The overall effect of such a limit would almost certainly have influenced the mean scores and other statistical tests. In this instance the 'Daily P.E.' group may have been disadvantaged by having the larger percentage of children at the ceiling level.

Similar to the analyses of the Staffordshire Test of Computation the group of children from school F was withdrawn. It was important to examine the

Boys

Description	'Daily' Pre-	'Daily' Post-	'Rednor' Pre-	'Rednor' Post-
'Retarded'	4%	14%	4%	8%
'Normal'	81%	70%	65%	81%
'Superior'	15%	16%	31%	11%
Mean	10.45	11.53	10.79	11.57
Number	116		26	

Girls

Description	'Daily' Pre-	'Daily' Post-	'Rednor' Pre-	'Rednor' Post-
'Retarded'	19%	4%	0%	4%
'Normal'	74%	76%	78%	61%
'Superior'	8%	20%	22%	35%
Mean	10.63	11.55	10.83	12.29
Number	99		23	

Table 6.24 Reading age divisions and mean scores.

remaining children from the 'Normal P.E.' group ('Rednor') in the Gapadol Reading Comprehension Test.

In keeping with the procedure used in analyses of the Staffordshire Test of Computation, the reading age scores were divided into reading ability categories for the 'Daily P.E.' group and the 'Rednor' group.

Table 6.24 indicated that the percentage in the 'retarded' category increased from test to re-test for both groups of boys and for the 'Normal P.E.' girls. Although the 'Daily P.E.' boys and girls and the 'Rednor' girls increased the percentage numbers in the 'superior' category, the 'Rednor' boys decreased from 31% to 11%.

The 'Rednor' group had higher pre- and post-programme mean scores than the 'Daily P.E.' group. Although the mean reading age scores increased for both groups, the 'Rednor' girls and the 'Daily P.E.' boys made greater improvement than their respective sex in the other group.

A two-way analysis of variance was used on the 'change' scores of the 'Daily P.E.' group and the 'Rednor' group. There was no difference between the groups, between the sexes, nor was there a group by sex interaction at the 0.05 level of significance.

Using a two-tailed t-test it was established that there were no differences, at the 0.05 level of significance, between the 'Daily P.E.' children and the children on 'normal' physical education, regardless of socio-economic background.

From the statistical testing carried out on the scores from the Gapadol Reading Comprehension Test in Model 1, it could be asserted that there was no difference between the 'Daily P.E.' and the 'Normal P.E.' groups in reading comprehension, regardless of socio-economic background.

Boys

	'Daily P.E.'		'Normal P.E.'	
	mean	sd	mean	sd
Pre-	11.2	2.15	12.5	2.43
Post-	12.9	2.73	13.6	2.76
'change'	1.7		1.1	
n	85		25	

Girls

	'Daily P.E.'		'Normal P.E.'	
	mean	sd	mean	sd
Pre-	11.5	2.46	12.3	2.41
Post-	12.9	2.60	13.4	2.67
'change'	1.4		1.1	
n	79		20	

Table 6.25 Mean reading age, standard deviations and mean 'change' scores.

Boys

	'Daily P.E.'		'Normal P.E.'			
	mean	sd	mean	sd	t	p
Pre-	11.22	2.15	12.50	2.43	2.53	0.013
Post-	12.88	2.73	13.63	2.76	1.21	0.230
n	85		25			

Table 6.26 Two-tailed t -test of reading ages.

6.5 Model 2.

In the pre- and post-programme testing of the Gapadol Test of Reading Comprehension the mean scores of both the 'Daily P.E.' and 'Normal P.E.' groups were quite diverse (table 6.25).

The 'Normal P.E.' group had superior mean pre- and post-programme scores to the 'Daily P.E.' group, both boys and girls. However, the 'Daily P.E.' group, boys and girls, had superior 'change' scores to the 'Normal P.E.' group and the gap between the groups closed over the year (table 6.25).

A two-way analysis of variance, using the 'change' scores, indicated that there was no difference between the groups, the sexes, nor group by sex interaction, at the 0.05 level of significance.

The two-tailed t-test, used to examine for differences between the two groups, indicated a pre-programme difference between the 'Daily P.E.' boys and the 'Normal P.E.' boys (table 6.26). The latter group had a superior score ($p<0.05$) to the 'Daily P.E.' boys. However, there were no differences between the boys, nor between the girls at the post-programme testing.

While table 6.25 indicated some change in performance, the statistical techniques (analysis of

Boys

Description	'Daily' Pre-	'Daily' Post-	'Normal' Pre-	'Normal' Post-
'Retarded'	9%	9%	8%	12%
'Normal'	80%	66%	64%	48%
'Superior'	11%	25%	28%	40%
Mean	11.22	12.88	12.50	13.63
S.D.	2.15	2.73	2.43	2.76
Number	85		25	

Girls

Description	'Daily' Pre-	'Daily' Post-	'Normal' Pre-	'Normal' Post-
'Retarded'	13%	4%	5%	5%
'Normal'	67%	72%	75%	65%
'Superior'	20%	24%	20%	30%
Mean	11.52	12.94	12.29	13.42
S.D.	2.46	2.60	2.41	2.67
Number	79		20	

Table 6.27 Reading age divisions, mean scores and standard deviations.

variance and t-test) used on the Gapadol test of Reading Comprehension scores, indicated no differences on all tests, with the exception of the t-test pre-programme scores of the boys.

To establish more information on the two groups, the division of reading ages, previously described in Model 1, was constructed (table 6.27).

Over the year the 'Daily P.E.' girls had reduced the percentage of cases in the 'retarded' category (13%-4%) while the 'Normal P.E.' boys increased the percentage (8%-12%) in the same category. All groups increased the percentage of children in the 'superior' category. Although the greatest percentage increase in the superior category, came from the 'Daily P.E.' boys, the largest percentage came from the 'Normal P.E.' group, boys and girls.

In the 'Daily P.E.' group there were 11 boys and 14 girls (15%) who reached the 'ceiling' reading age of 16 years 10 months at the conclusion of the programme. There were 4 boys and 4 girls (18%) in the 'Normal P.E.' group who reached the same level. As aforementioned in Model 1, the 'ceiling' effect could influence the mean and 'change' scores and in this instance could have been to the disadvantage of the 'Normal P.E.' group.

Boys

Description	'Daily' Pre-	'Daily' Post-	'Rednor' Pre-	'Rednor' Post-
'Retarded'	9%	9%	8%	15%
'Normal'	80%	66%	62%	62%
'Superior'	11%	25%	31%	23%
Mean	11.22	12.88	12.46	12.67
Number	85		13	

Girls

Description	'Daily' Pre-	'Daily' Post-	'Rednor' Pre-	'Rednor' Post-
'Retarded'	13%	4%	0%	0%
'Normal'	67%	72%	79%	79%
'Superior'	20%	24%	21%	21%
Mean	11.52	12.94	12.33	12.92
Number	79		14	

Table 6.28 Reading age divisions and mean scores.

Source	df	ms	F
group	1	29.74	12.6***
sex	1	0.98	0.4
group x sex	1	2.42	1.0
residual	187	2.33	
total	190	2.46	

*** $p < 0.001$

Table 6.29 Analysis of variance using 'change' scores of reading age.

	'Daily'	'Normal'
'Change'	1.55	0.41
Number	164	27

Table 6.30 Mean 'change' scores of Reading Age.

In previous analyses of the academic scores the influence of school F was considered. With the 'Normal P.E.' group reduced the children from similar socio-economic backgrounds, 'Daily P.E.' and 'Rednor', were compared (table 6.28).

The 'Rednor' boys had an increased percentage in the 'retarded' category and a reduced percentage in the 'superior' category. The 'Rednor' girls made no change in category percentages from pre- to post-programme. The 'Daily P.E.' group had an inferior pre-programme mean reading age to the 'Rednor' and, although both groups increased their scores, the 'Daily P.E.' group had a superior post-programme mean for boys and girls.

A two-way analysis of variance, using 'change' scores, showed a difference between the groups (table 6.29).

The 'Daily P.E.' group showed greater improvement ($p < 0.001$) on completion of the year than the 'Rednor' group (table 6.30).

A two-tailed t-test was used on the pre- and post-programme scores of the 'Daily P.E.' and 'Rednor' groups. There were no differences between the two groups of boys, nor between the two groups of girls, before or after the programme, at the 0.05 level of significance.

From analyses of the 'Normal P.E.' and 'Daily P.E.' groups in Model 2 there were no differences in reading age at the completion of the year. However, when the 'Daily P.E' and 'Rednor' groups, in Model 2, were analysed, it appeared that the 'Daily P.E.' group had made greater progress, over the year, than the 'Rednor' group, in the Gapadol Test of Reading Comprehension.

Boys

	'DPE2'		'Normal P.E.'	
	mean	sd	mean	sd
Pre-	12.2	2.52	12.5	2.43
Post-	13.0	2.74	13.6	2.76
'change'	0.8		1.1	
n	32		25	

Girls

	'DPE2'		'Normal P.E.'	
	mean	sd	mean	sd
Pre-	12.9	2.91	12.3	2.41
Post-	13.5	2.75	13.4	2.67
'change'	0.6		1.1	
n	22		20	

Table 6.31 Mean scores, standard deviations and 'change' scores.

6.6 Model 3.

The 'DPE2' boys had an inferior pre-programme mean score on the Gapadol Test of Reading Comprehension to the 'Normal P.E.' boys (table 6.31). The 'DPE2' girls had a superior pre-programme mean reading age to the 'Normal P.E.' girls. At the conclusion of the programme in primary 7 the 'DPE2' and 'Normal P.E.' groups, boys and girls, had increased mean scores. Although the 'Normal P.E.' boys and girls had superior 'change' scores to the 'DPE2' group, the 'DPE2' girls had a superior post-programme mean score than the 'Normal P.E.' girls.

The two-tailed t-test was used and there were no differences between the two groups, boys or girls, at pre- and post-programme at the 0.05 level of significance.

A two-way analysis of variance, using the 'change' scores also indicated that there was no difference between the groups, the sexes, nor was there a group by sex interaction.

The children in Model 2 who had experienced 'Daily P.E.' only at primary 7 ('DPE1') were included in the analysis to examine the influence of 2 years of daily physical education ('DPE2') against one year daily physical education and 'normal' physical

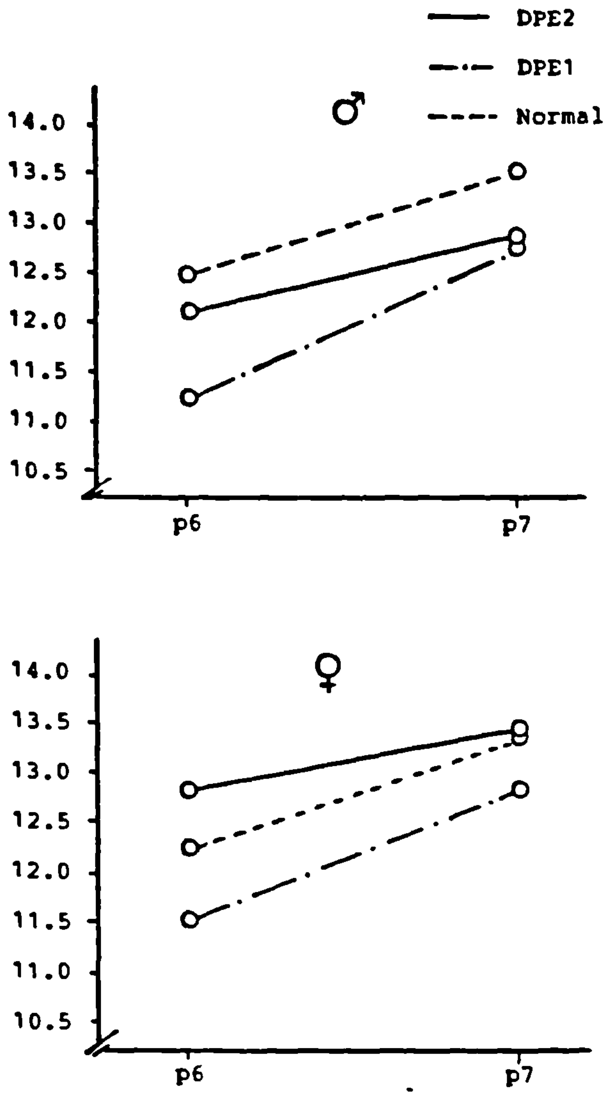


Figure 6.2 Mean Reading Age.

Description	'DPE2' (♂) Pre-	Post-	'Rednor' (♂) Pre-	Post-	'DPE2' (♀) Pre-	Post-	'Rednor' (♀) Pre-	Post-
'Retarded'	9%	6%	8%	15%	9%	0%	0%	0%
'Normal'	63%	72%	62%	62%	50%	64%	79%	79%
'Superior'	28%	22%	31%	23%	41%	36%	21%	21%
Mean	12.18	12.98	12.46	12.67	12.85	13.54	12.33	12.92
Number	32		13		22		14	

Table 6.32 Divisions and mean reading age scores.

education. From figure 6.2 it could be seen that the boys from 'DPE2' and 'Normal P.E.' had a similar pre-programme mean reading age. The 'DPE2' girls were superior at pre-programme to the other two groups. At post-programme testing the 'Normal P.E.' boys made the greatest improvement and were superior to the other two groups. The 'DPE2' boys were slightly ahead of the 'DPE1' boys. The 'DPE2' girls were superior to the other two groups at post-programme. Nevertheless, from figure 6.2 and supported by the two statistical tests (analysis of variance and t-test), the programme of daily physical education appeared to have no significant influence on the reading comprehension of the children in this study.

In keeping with the attention paid earlier in this chapter to the socio-economic influence of the children from school F, this was examined with the 'DPE2' and 'Normal P.E.' groups (table 6.32).

The percentage of children from the 'DPE2' group in the 'retarded' reading ability category had decreased while 'Rednor' boys increased and the girls remained the same in this category. The 'DPE2' girls and 'Rednor' boys had greater percentages in the 'superior' category at the pre- and post-programme testing. The boys from both groups and the girls of the 'DPE2' group had reduced percentages in the 'superior' category.

	'DPE2'		'Rednor'	
Sex	Boys	Girls	Boys	Girls
Number	5	7	3	2
%	22		19	

Table 6.33 Number and percentage of children reaching 'ceiling' reading age.

	Boys		Girls	
	'DPE2'	'Rednor'	'DPE2'	'Rednor'
'Change'	0.79	0.21	0.69	0.59
n	32	13	22	14

Table 6.34 Mean 'change' scores of reading age.

At post-programme testing, 22% of the 'DPE2' group reached the 'ceiling' reading age compared to 19% of the 'Rednor' group (table 6.33).

As discussed earlier, the 'ceiling' effect may have constrained the 'DPE2' group, more than the 'Rednor' group, from attaining higher mean and 'change' scores.

The 'Rednor' boys had a superior pre-programme mean score to the 'DPE2' boys. However, the 'DPE2' group, boys and girls, made greater improvement than the 'Rednor' group, over the year (table 6.34). Nevertheless, using a two-way analysis of variance on the 'change' scores of the 'DPE2' and 'Rednor' groups, there was no difference between the groups, the sexes, nor was there a group by sex interaction, at the 0.05 level of significance.

The two-tailed t-test was used on the pre- and post-programme scores of the 'DPE2' and 'Rednor' groups. There were no differences between the two groups, boys or girls, at pre- and post-programme at the 0.05 level of significance.

Similar to the analyses of arithmetic quotients, it would appear that the children on the daily physical education programme for two years had not fallen behind the children on 'normal' physical education programmes in reading comprehension, as measured by the Gapadol Test of Reading Comprehension.

Chapter 7.

Linwood Project - Affective and Attendance Analyses.

Introduction.

'Attitude to School'.

The 'Attitude to School Questionnaire' (Barker Lunn, 1969) was administered to determine whether there were any attitudinal differences between the children on daily physical education and the children on 'normal' physical education at the start and end of the school year.

The timing of test administration allowed the questionnaires to be completed by children who had the same class teacher at pre- and post-programme. It was important to examine the results for indications of attitudinal change.

The 'Attitude to School Questionnaire' consists of ten scales. Initially all ten scales were analysed (Appendix F) but interpretation was complex. Because of the similarity between scales it was decided to simplify the analysis by dividing them into the 'two neat clusters' identified by Barker Lunn (1969).

Scales A-G which were closely related to attitudes to school and school work were summed and labelled 'School Related Attitudes'. Children who scored highly on this cluster could be considered to have had a positive attitude to school and school work.

Scales G-J, which were closely related to the 'social relations and personality of the pupil' (Barker Lunn, 1969), have also been summed. For convenience this cluster has been referred to in this study as 'Pupil's Personality' and it is hoped that this title will not be misleading. Children who scored highly in this cluster could be considered to have a high self-image, get on well with classmates and are concerned but not anxious in class. Scale G, 'Relationship with teacher', was common to both clusters. Every child had a pre-programme and post-programme score for each cluster. The summed results in both clusters were examined in terms of 'absolute' scores and 'change' scores.

Attendance.

The attendance records of all the children, 'Daily P.E.' and 'Normal P.E.', were examined for the academic year preceding the programme. In Model 1 the attendance records were examined at the primary 5 stage and at the conclusion of the primary 6 stage. If the child had not been at the same school for both primary 5 and primary 6 sessions, then that child was excluded from the attendance analysis. The number of absences on completion of the primary 5 session were recorded as pre-programme scores and the number of absences on completion of primary 6 were recorded as post-programme scores.

In Model 2 the attendance records of the appropriate children in primary 6 and primary 7 were examined.

Model 3 consisted of the children who were experiencing a second year on the daily physical education programme (DPE2) at primary 7. The 'Normal P.E.' group in Model 3 were the same children who had been the 'Normal P.E.' group in Model 2.

In analyses of these data a low score (absences) indicated a high attendance. Caution was exercised in interpretation of the attendance figures. Since one recorded absence was equivalent to one half-day's absence from school, it was possible to overstate the magnitude of absence scores.

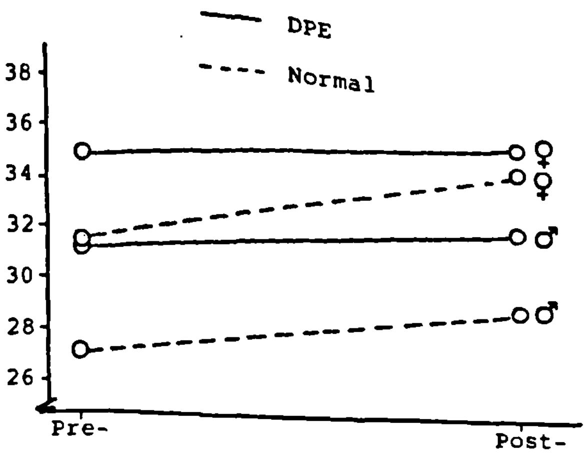


Figure 7.1 Mean scores of 'School Related Attitudes'.

	Boys		Girls	
	'Daily'	'Normal'	'Daily'	'Normal'
'change'	1.58	2.18	1.69	3.80
n	105	38	88	31

Table 7.1 Mean 'change' scores of 'School Related Attitudes'.

		'Daily P.E.'		'Normal P.E.'			
		mean	sd	mean	sd	t	p
Boys	Pre-	31.28	9.03	27.24	8.34	2.41	0.017
	Post-	32.86	9.50	29.42	8.85	1.94	0.054
Girls	Pre-	34.72	9.31	31.55	8.83	1.65	0.102
	Post-	36.41	8.91	35.35	7.04	0.60	0.553

Table 7.2 Means, standard deviations and t -test results of 'School Related Attitudes'.

7.1 Affective Analysis - Model 1.

The mean scores of Model 1, 'Daily P.E.' and 'Normal P.E.' children, were calculated using the pre-programme and post-programme Barker Lunn 'Attitude to School' scores divided into two clusters, 'School Related Attitudes' and 'Pupil's Personality'.

The 'Daily P.E.' group were superior in 'School Related Attitudes', at pre- and post-programme, to the 'Normal P.E.' children (figure 7.1).

A two-tailed t-test was carried out on all pre- and post-programme scores, for boys and girls. At pre-programme testing there was a difference ($p<0.05$) between the two groups of boys, (table 7.2). However, at post-programme testing there were no differences, at the 0.05 level of significance, between the two groups, boys or girls.

A two-way analysis of variance failed to indicate differences, in 'change' scores, between the groups, between the sexes, and there was not a group by sex interaction, at the 0.05 level of significance. From figure 7.1, it could be seen that both groups, 'Daily P.E.' and 'Normal P.E.', boys and girls, had improved from pre- to post-programme, in 'School Related Attitudes' (see also table 7.1).

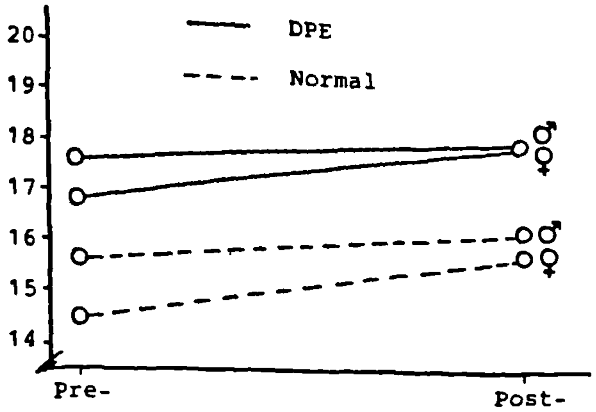


Figure 7.2 Mean scores of 'Pupil's Personality'.

		'Daily P.E.'		'Normal P.E.'			
		mean	sd	mean	sd	t	p
Boys	Pre-	17.71	5.24	15.76	4.38	2.05	0.040
	Post-	18.32	5.32	16.42	4.33	1.98	0.050
Girls	Pre-	16.81	4.62	14.48	4.46	2.43	0.017
	Post-	18.28	4.62	15.94	4.48	2.45	0.016

Table 7.3 Means, standard deviations and t-test results of 'Pupil's Personality'.

	Boys		Girls	
	'Daily'	'Normal'	'Daily'	'Normal'
'change'	0.61	0.66	1.47	1.46
n	105	38	88	31

Table 7.4 Mean 'change' scores of 'Pupil's Personality'.

In the second cluster, 'Pupil's Personality', the 'Daily P.E' boys and girls were superior to their respective sexes in the 'Normal P.E.' group at pre- and post-programme testing (figure 7.2).

A two-tailed t-test was carried out on all pre- and post-programme scores, for boys and girls. At pre-programme testing there were differences between the two groups of boys ($p<0.05$) and between the two groups of girls ($p < 0.05$), (table 7.3). At post-programme the 'Daily P.E.' boys and girls were superior, at the 0.05 level of significance, to the 'Normal P.E.' boys and girls, in 'Pupil's Personality' scores (table 7.3).

A two-way analysis of variance failed to indicate differences, in 'change' scores, between the groups, between the sexes, and there was not a group by sex interaction, at the 0.05 level of significance. From figure 7.2, it can be seen that the 'Daily P.E.' boys and girls and the 'Normal P.E.' group improved from pre- to post-programme, in 'Pupil's Personality' (see also table 7.4).

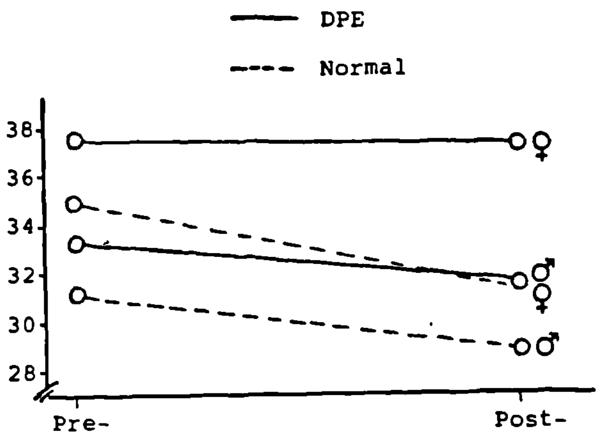


Figure 7.3 Mean scores of 'School Related Attitudes'.

	Boys		Girls	
	'Daily'	'Normal'	'Daily'	'Normal'
'change'	-1.30	-2.45	-0.50	-3.35
n	75	22	73	17

Table 7.5 Mean 'change' scores of 'School Related Attitudes'.

		'Daily P.E.'		'Normal P.E.'			
		mean	sd	mean	sd	t	p
Boys	Pre-	33.20	8.00	31.27	8.69	0.98	0.33
	Post-	31.90	8.30	28.82	7.39	1.59	0.12
Girls	Pre-	37.50	6.10	35.00	7.10	1.50	0.14
	Post-	37.00	7.70	31.65	7.64	2.57	0.01

Table 7.6 Means, standard deviations and t -test results of 'School Related Attitudes'.

7.2 Affective Analysis - Model 2.

As in Model 1, the mean scores of Model 2, 'Daily P.E.' and 'Normal P.E.' children, were calculated using the pre-programme and post-programme Barker Lunn 'Attitude to School' scores divided into two clusters, 'School Related Attitudes' and 'Pupil's Personality'.

The boys and girls of the 'Daily P.E.' group were superior in 'School Related Attitudes', at pre- and post-programme, to their 'Normal P.E.' counterparts (figure 7.3).

A two-tailed t-test was carried out on all pre- and post-programme scores for boys and girls. At pre-programme testing there was no difference, at the 0.05 level of significance, between the two groups of boys, nor between the two groups of girls. Although both groups regressed over the year in 'School Related Attitudes' (table 7.5), the 'Daily P.E.' girls were significantly superior to the 'Normal P.E.' girls ($p \leq 0.01$) at the post-programme stage (table 7.6).

A two-way analysis of variance failed to indicate differences in 'change' scores, between the groups, between the sexes, and there was not a group by sex interaction, at the 0.05 level of significance.

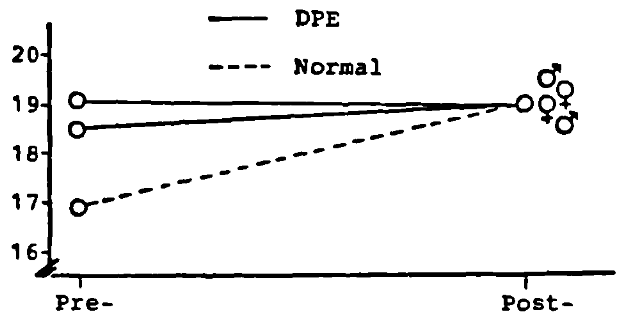


Figure 7.4 Mean scores of 'Pupil's Personality'.

	♂ 'Daily P.E.'		♂ 'Normal P.E.'		♀ 'Daily P.E.'		♀ 'Normal P.E.'	
	mean	sd	mean	sd	mean	sd	mean	sd
Pre-	18.55	5.31	16.91	3.93	19.10	5.29	16.94	5.44
Post-	19.03	5.36	19.18	4.91	19.04	5.08	19.12	4.12
'change'	0.48		2.27		-0.06		2.18	
n	75		22		73		17	

Table 7.7 Means, standard deviations and 'change' scores of 'Pupil's Personality'.

In the second cluster, 'Pupil's Personality', the 'Daily P.E.' boys and girls were superior to their respective sexes in the 'Normal P.E.' group at pre-programme testing. At the post-programme stage both groups of boys and the 'Normal P.E.' girls improved and the 'Daily P.E.' girls regressed. The 'Normal P.E.' group were marginally superior to the 'Daily P.E.' group at the post-programme stage in 'Pupil's Personality' (figure 7.4, table 7.7).

A two-tailed t-test was carried out on all pre- and post-programme scores, for boys and girls. There was no difference between the two groups of boys, nor between the two groups of girls, pre- or post-programme at the 0.05 level of significance.

A two-way analysis of variance failed to indicate differences in 'change' scores, between the groups, between the sexes, and there was not a group by sex interaction, at the 0.05 level of significance.

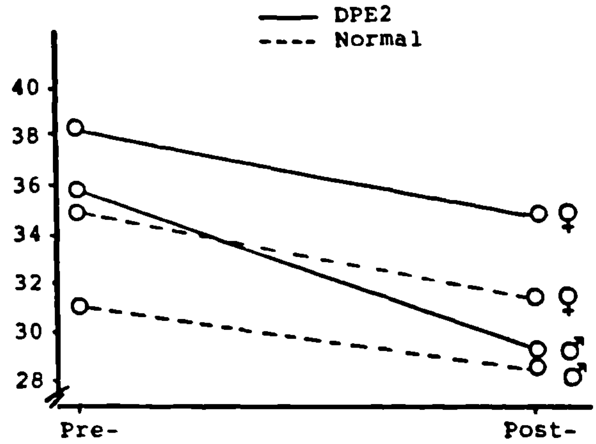


Figure 7.5 Mean scores of 'School Related Attitudes'.

		'DPE2'		'Normal P.E.'			
		mean	sd	mean	sd	t	p
Boys	Pre-	36.00	5.66	31.27	8.69	2.41 ✠	0.032
	Post-	29.67	7.88	28.82	7.39	0.40	0.690
Girls	Pre-	38.25	6.93	35.00	7.10	1.41	0.170
	Post-	34.95	7.88	31.65	7.64	1.29	0.210

Table 7.8 Means, standard deviations and t-test results of 'School Related Attitudes'.

✠ Separate Variance.

	Boys		Girls	
	'DPE2'	'Normal'	'DPE2'	'Normal'
'change'	-6.33	-2.45	-3.30	-3.35
n	31	22	20	17

Table 7.9 Mean 'change' scores of 'School Related Attitudes'.

7.3 Affective Analysis - Model 3.

The mean scores of the children who had experienced two years of daily physical education (DPE2) and the 'Normal P.E.' children were calculated using the same procedures as that adopted in Models 1 and 2. The pre-programme and post-programme Barker Lunn 'Attitude to School' scores were divided into two clusters, 'School Related Attitudes' and 'Pupil's Personality'.

The boys and girls of the 'DPE2' group had superior mean scores in 'School Related Attitudes', at pre- and post-programme, to the 'Normal P.E.' children (figure 7.5).

A two-tailed t-test was carried out on all pre- and post-programme scores for boys and girls. At pre-programme testing the 'DPE2' boys were significantly superior ($p<0.05$) to the 'Normal P.E.' boys. There were no differences, at the 0.05 level of significance, between the two groups of girls at pre- and post-programme testing, nor between the boys at post-programme testing (table 7.8).

A two-way analysis of variance failed to indicate a difference in 'change' scores, between the groups, between the sexes, and there was not a group by sex interaction, at the 0.05 level of significance.

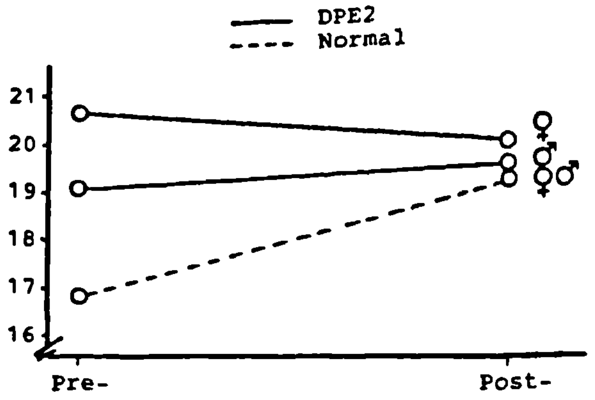


Figure 7.6 Mean scores of 'Pupil's Personality'.

		'DPE2' mean	'DPE2' sd	'Normal P.E.' mean	'Normal P.E.' sd	t	p
Boys	Pre-	19.09	5.21	16.91	3.93	1.66	0.103
	Post-	19.48	4.59	19.18	4.91	0.23	0.819
Girls	Pre-	20.65	5.59	16.94	5.44	2.04	0.049
	Post-	19.90	5.14	19.12	4.12	0.50	0.617

Table 7.10 Means, standard deviations and t-test results of 'Pupil's Personality'.

Source	df	ms	F
Group	1	102.16	4.65*
Sex	1	26.20	1.19
Group x Sex	1	4.83	0.22
Residual	86	21.95	
Total	89	22.66	

* $p<0.05$

Table 7.11 Analysis of Variance on the 'change scores of 'Pupil's Personality'.

	Boys 'DPE2'	Boys 'Normal'	Girls 'DPE2'	Girls 'Normal'
'change'	0.39	2.27	-0.75	2.18
n	31	22	20	17

Table 7.12 Mean 'change' scores of 'Pupil's Personality'.

From figure 7.5 and Table 7.9, it can be seen that the boys and girls of the 'DPE2' and the 'Normal P.E.' group had regressed over the year in 'School Related Attitudes'.

In the second cluster, 'Pupil's Personality', the 'DPE2' boys and girls were superior to their respective sexes in the 'Normal P.E.' group at pre- and post-programme testing (figure 7.6). From figure 7.6 it could be seen that both groups of boys and the 'Normal P.E.' girls had improved from pre- to post-programme in 'Pupil's Personality' and the 'DPE2' girls had regressed.

A two-tailed t-test was carried out on all pre- and post-programme scores for boys and girls. At pre-programme testing the 'DPE2' girls were significantly superior ($p<0.05$) to the 'Normal P.E.' girls. There were no differences at the 0.05 level of significance, between the two groups of boys at pre- and post-programme testing, nor between the girls at post-programme testing (table 7.10).

A two-way analysis of variance indicated that there was a group difference ($p<0.05$) using 'change' scores (table 7.11). The 'Normal P.E.' group had superior 'change' scores to the 'DPE2' group (table 7.12).

	BOYS				GIRLS			
	'Daily'		'Normal'		'Daily'		'Normal'	
mean	27.2	24.2	17.4	20.3	26.5	27.2	19.2	18.2
sd	35.4	18.9	19.7	18.9	18.1	19.8	16.8	16.6
n	124		57		103		46	

Table 7.13 Mean 'absence' scores and standard deviations.

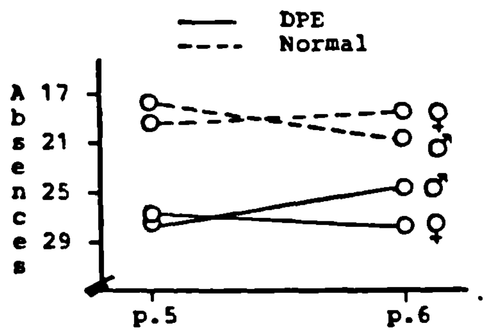


Figure 7.7 Mean 'absence' scores at primary 5 and primary 6.

	BOYS				GIRLS			
	'Daily'		'Normal'		'Daily'		'Normal'	
mean	22.7	25.3	21.9	22.6	21.0	20.8	19.8	20.4
sd	19.6	20.8	15.9	25.3	15.6	20.5	18.5	23.8
n	92		45		87		39	

Table 7.14 Mean 'absence' scores and standard deviations.

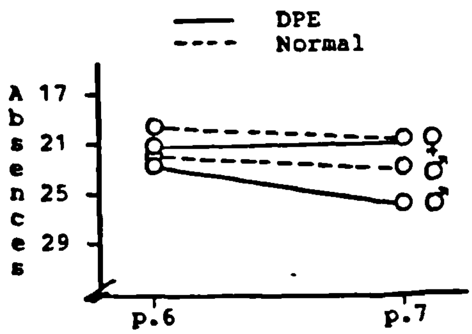


Figure 7.8 Mean 'absence' scores at primary 6 and primary 7.

7.4 Attendance Analyses - Models 1,2 and 3.

In each of the Models a two-way analysis of variance failed to indicate a difference in 'change' scores between the groups, between the sexes, and there was not a group by sex interaction, at the 0.05 level of significance.

Although the absence 'change' scores were not significant the data from the analyses of attendance have been included (tables 7.13, 7.14, 7.15 and figures 7.7, 7.8 and 7.9). However, it must be stressed that any improvement or regression in attendance may due to chance and no claims are being made regarding the influence of the daily physical education programme on the attendance of the pupils.

	♂ 'DPE2'		♂ 'Normal'		♀ 'DPE2'		♀ 'Normal'	
mean	26.5	23.5	21.9	22.6	22.8	24.3	19.8	20.4
sd	22.1	16.6	15.9	25.3	26.9	21.4	18.5	23.8
'change'	3.0		-0.7		-1.5		-0.6	
n	33		45		21		39	

Table 7.15 Mean, standard deviations and 'change' scores of 'absences.'

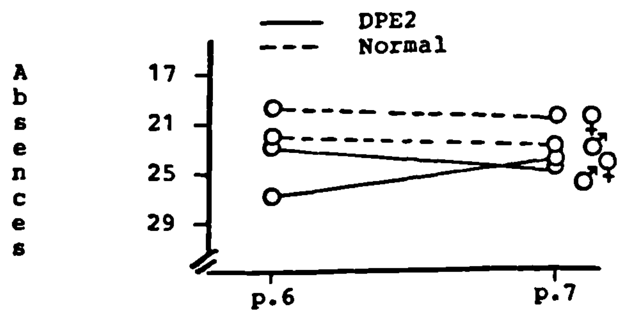


Figure 7.9 Mean 'absence' scores at primary 6 and primary 7.

Chapter 8.

Cross Model Results.

In this chapter the cross-model results will be examined in relation to each other and the hypotheses stated at the outset of the study.

As indicated in earlier chapters certain items which had been examined in the 'Pilot Study' were not pursued in the later studies. In this section it is intended to examine those factors which were looked at initially in the 'Pilot Study' and followed up in the Linwood Project. However, it should be borne in mind that the pupils in school F were only tested in the academic and affective domains.

Each of the domains, physical, academic and affective, will be examined across the models.

8.1 Motor Fitness.

Although there were no significant differences between the Pilot Study groups in the CAHPER Fitness-Performance II Tests, there were indications that the programme could have positively influenced the scores of the 'Daily P.E.' group. With the exception of the boys' shuttle run and standing long jump, the 'Daily P.E.' group, boys and girls, improved on all items. The 'Normal P.E.' boys regressed on shuttle run, standing long jump, and flexed arm hang, and the girls regressed on flexed arm hang. At the post-programme stage the 'Daily P.E.' group were superior to the 'Normal P.E.' group on all items except shuttle run (girls), standing long jump (boys) and 50 metre run (boys and girls).

The influence of the programme was more pronounced in the Linwood Project. When the CAHPER scores were summed and transformed into 'T' scores the 'Daily P.E.' groups of Model 1 (primary 6), Model 2 (primary 7, 'DPE1') and Model 3 (primary 7, 'DPE2') had shown greater improvement than, and were superior to, the 'Normal P.E.' groups. In Models 2 and 3 the 'Daily P.E.' boys were significantly superior to the 'Normal P.E.' boys ($P<0.05$). The 'Daily P.E.' girls were significantly superior to the 'Normal P.E.' girls in Model 1 ($p<0.05$) and Model 3 ($p\leq0.001$).

In Models 1 and 2 the 'Daily P.E.' boys and girls improved on every item and, with the exception of standing long jump (girls in Model 2), made greater improvements on every item than the 'Normal P.E.' groups. In keeping with the 'Pilot Study' results, which showed that the 'Normal P.E.' boys and girls regressed on shuttle run, the same results were shown in Models 1 and 2. Although the 'Normal P.E.' boys and girls in Model 1 improved on all other items, the boys in Model 2 also regressed on standing long jump, 50 metre run and endurance run and the girls on 50 metre run. All of these activities are related to the use of the legs and the results would seem to indicate that the primary 7 boys in particular do not receive sufficient appropriate activity during 'normal' physical education to maintain the post-summer vacation fitness levels.

The endurance run is the only activity in the CAHPER battery which measures cardiorespiratory fitness, an important factor in heart fitness. In the endurance run significant differences ('change' scores) existed between the 'Daily P.E.' groups and the 'Normal P.E.' groups in Model 1 ($p<0.05$), Model 2 ($p < 0.001$) and Model 3 ($p<0.05$) with the 'Daily P.E.' boys and girls showing greater improvement than the 'Normal P.E.' children in each model.

The boys had superior mean scores to their respective groups of girls in almost all tests across the models. The exceptions existed only at the post-programme stage and were: 'Daily P.E.' - shuttle run (Models 1,3), standing long jump (Pilot Study), sit-ups (Model 3), and 'Normal P.E.' - 50 metre run (Pilot Study). The 'Normal P.E.' girls had a superior mean score to the 'Daily P.E.' boys in the 50 metre run in the Pilot Study. However, the 'Daily P.E.' girls had superior mean scores to the 'Normal P.E.' boys in: shuttle run (Models 1,2,3), standing long jump (Pilot Study, Models 1,3), sit-ups (Pilot Study, Model 3), flexed arm hang (Pilot Study, Model 3) and 50 metre run (Models 1,2,3). In effect the girls on a second year of daily physical education were superior in all tests of the CAHPER Fitness-Performance II battery, with the exception of the endurance run, to the 'Normal P.E.' boys and girls in all models.

In the Pilot Study the 'Daily P.E.' group were superior to the 'Normal P.E.' group in the sit and reach test of flexibility. The 'Daily P.E.' boys and girls improved ($p < 0.001$) from pre- to post-programme stages while the 'Normal P.E.' children regressed. At the post-programme stage the girls were superior to the boys. The Pilot Study results suggested that, unless there was intervention, the flexibility of the children would regress over the year.

In the Linwood Project the 'Daily P.E.' group improved over the 'Normal P.E.' group in Models 2 ($p<0.001$). The 'Normal P.E.' girls had improved flexibility from pre- to post-programme in Model 1 but regressed in Model 2. The girls of both groups had superior flexibility to the boys throughout the study. This is in keeping with available research which indicates that females appear to maintain greater flexibility than males (Kirchner and Glines, 1957; Di Nucci, 1976).

The pre-programme mean flexibility score of the 'Normal P.E.' boys in Model 1 was superior to the mean post-programme score of the 'Normal P.E.' boys in Model 2. This supports the evidence that there is a progressive deterioration in flexibility by boys because of the 'increased size of muscle groups and tone' as they get older (Zaichkowsky et al., 1980). However, the 'Daily P.E.' boys improved in flexibility from pre-programme testing in Model 1 to post-programme testing in Model 2. This would seem to suggest that unless there is positive intervention to influence this aspect of fitness, flexibility in boys will decrease with age.

There is strong evidence to suggest that the daily physical education programme has positively influenced the motor fitness of the children in this study, as measured by the CAHPER Fitness-Performance II battery and the Sit and Reach test of flexibility. By the same measures the children who had experienced two years of daily physical education were fitter than the children who had experienced one year in the programme.

8.2 Academic.

In the Pilot Study the results from the Staffordshire Test of Computation indicated a group difference ($p < 0.01$) from pre- to post-programme testing with the 'Daily P.E.' children superior to the 'Normal P.E.' group. The 'Daily P.E.' boys and the 'Normal P.E.' girls had superior pre-programme arithmetic quotients to their own sex in the other group. While all groups improved, the 'Daily P.E.' boys and girls were superior at the post-programme stage to the 'Normal P.E.' children. The 'Daily P.E.' boys had the highest mean arithmetic quotient.

In the Gapadol Test of Reading Comprehension there was not a group difference at the 0.05 level of significance using 'change' scores, but there was a sex difference from pre- to post-programme testing. The girls had a superior 'change' score ($p < 0.05$) to the boys. The 'Normal P.E.' boys and the 'Daily P.E.' girls had superior pre-programme reading ages to their own sex in the other group. At the post-programme stage the 'Daily P.E.' boys and the 'Normal P.E.' girls had superior scores.

The results from the two academic tests in the Pilot Study suggested that the 'Daily P.E.' children had surpassed the 'Normal P.E.' children in Staffordshire Test of Computation and there was no difference in the Gapadol Test of Reading Comprehension.

Although this was a small sample there was an indication that the 'Daily P.E.' programme was not having a harmful effect on the academic performance of the children and indeed may have promoted an improved performance, particularly in computation.

In the Linwood Project the 'Daily P.E.' boys and girls made greater progress than the 'Normal P.E.' boys and girls in the test of computation in Models 2 ($p < 0.001$) and 3 ($p < 0.001$). While the 'Normal P.E.' boys and girls of primary 7 regressed over the year in mean arithmetical quotients the children engaged in their second year of the daily physical education programme (Model 3) progressed from having inferior mean arithmetical quotients at pre-programme testing to having superior scores to the 'Normal P.E.' group at the post-programme stage.

When the 'Normal P.E.' groups were reduced, by the extraction of the higher socio-economic group (school F), the Daily P.E.' groups made greater progress over the year in each model and for each sex than the reduced 'Normal P.E.' groups ('Rednor') in the test of computation. The 'Daily P.E.' groups also had superior mean arithmetical quotients at post-programme testing in Model 1 (boys and girls) and in Model 3 (boys and girls) to the 'Rednor' groups.

The 'Daily P.E.' boys had similar scores to the 'Rednor' boys in Model 2.

The computation results from the Pilot Study have been replicated in the Linwood Project and it would appear that the children engaged in the daily physical education programmes, for one and two years, had not fallen behind their peers in the 'normal' programmes. The results actually indicated that the 'Daily P.E.' children at the primary 7 stage had made greater progress than the 'Normal P.E.' children in computation.

There were no significant differences between the groups, in the Gapadol Test of Reading Comprehension, in the three models at the 0.05 level of significance. However, in Model 2 ($p < 0.001$) the 'Daily P.E.' group made greater improvement than the 'Rednor' group in reading comprehension ages.

In the Linwood Project the children engaged in the daily physical education programmes maintained their academic progress along with the children in the 'normal' physical education programmes. At the primary 7 stage the 'Daily P.E.' children made greater progress in computation than the 'Normal P.E.' children.

8.3 Affective.

In the Pilot Study the 'Daily P.E.' boys and girls had superior 'School Related Attitudes' to the 'Normal P.E.' children at post-programme testing. They also made greater positive changes to their scores from pre- to post-programme testing than the 'Normal P.E.' children. In 'Pupil's Personality' the 'Daily P.E.' children had superior pre-programme scores to the 'Normal P.E.' children. Although the 'Daily P.E.' boys regressed slightly, the 'Daily P.E.' boys and girls had superior post-programme scores to the 'Normal P.E.' children. In the 'Daily P.E.' group the boys tended to have a better post-programme mean score in 'School Related Attitudes' and the girls had a better mean score in 'Pupil's Personality'.

The Pilot Study results suggested that the children engaged in the daily physical education programme had more positive 'School Related Attitudes' and 'Pupil's Personality' scores than the children on 'normal' physical education.

There was no difference in 'change' scores on 'School Related Attitudes' between the groups, between the sexes, nor was there a group by sex interaction, at the 0.05 level of significance in any of the models. However, in Models 1, 2 and 3 the

'Daily P.E.' boys and girls had superior mean scores at pre- and post-programme testing to the 'Normal P.E.' groups. On exmination of tables 7.2, 7.6 and 7.8 it could be seen that, rather than the 'Daily P.E.' boys in Model 1 having a high pre-programme score, the significant difference ($p<0.05$) between the two groups may have been due to the low score of the 'Normal P.E.' boys. There is no apparent reason for this. The intervention programme in Primary 6 may be a possible explanation for the significant pre-programme difference ($p<0.05$) between the two groups of boys in Model 3 (table 7.8). While the primary 6 (Model 1) children improved their mean scores from pre- to post-programme, the boys and girls of the 'Daily P.E.' and 'Normal P.E.' groups, at primary 7 (Models 2 and 3), had decreased mean 'School Related Attitudes' scores.

The girls had superior mean scores on 'School Related Attitudes' to the boys at pre- and post-programme in Models 1, 2 and 3. This was in keeping with Barker Lunn's (1972) results.

The 'Daily P.E.' boys and girls had superior pre- and post-programme mean scores to the 'Normal P.E.' group on 'Pupil's Personality' in Model 1 ($p<0.05$). An explanation similar to that put forward for pre-programme difference on 'School Related Attitudes' may also be suggested for 'Pupil's Personality' in

Model 1 (table 7.4). The 'Daily P.E.' group had superior pre-programme scores in Model 2, but the 'Daily P.E.' girls regressed slightly and at the post-programme stage the two groups had similar mean scores. In Model 3 the 'Normal P.E.' group made significant improvement ($p < 0.05$) from the pre- to post-programme stage while the 'DPE2' group remained stable over the same period but had superior pre- and post-programme scores to the 'Normal P.E.' group.

Although Barker Lunn (1970) found that boys had more favourable attitudes than girls on the scales concerned with personality and social relationships, there was little difference between the boys' and the girls' scores in each of the models.

The results from this study would suggest that although the 'Daily P.E.' children in Models 1, 2 and 3 had better mean 'School Related Attitudes' than the 'Normal P.E.' children, there were no differences between the groups at the 0.05 level of significance.

Similarly, in 'Pupil's Personality' the results indicate that the 'Daily P.E.' groups had superior pre-programme scores in Models 1, 2 and 3 and superior post-programme scores in Models 1 and 3. However, the 'Normal P.E.' group had greater 'change' scores than the 'Daily P.E.' group in Model 3 ($p < 0.05$).

8.4 Attendance.

The attendances of the children in the Pilot Study indicated that both groups of girls reduced their absence rate to the same mean score but that the boys of the 'Daily P.E.' group reduced their mean absence score and had a superior attendance than the 'Normal P.E.' boys at the end of the year. Although there were no significant 'change' scores at the 0.05 level of significance the improvement in attendance scores suggested that the daily physical education programme may have had a positive influence on attendance.

However, the inference in the Pilot Study that the daily physical education programme may have had a positive influence on attendance was not substantiated in the Linwood Project. There were no significant differences in 'change' scores between the groups at the 0.05 level of significance.

These results suggest that the daily physical education programme had no obvious influence on the attendance of the boys or girls in this study.

Chapter 9.

Introduction: The Diffusion Process.

Rogers (1962) has described the 'diffusion process' as the spread of an idea from its source of invention to its ultimate users or adopters.

This study has already looked at the origins of the concept of daily physical education. The effects of a daily physical education programme on pre-adolescent children in the physiological, psychological and affective domains have also been examined.

However, the implementation and evaluation of this programme by its users have not been described. The significant groups who were involved in the implementation of the study consisted predominantly of the class teachers and specialist teachers of physical education. In addition to these two groups, parents, children and head teachers made comments through written and verbal reports, and questionnaires which assisted in the evaluation of this action research in curriculum development.

9.1 Evaluative Comments on the Programme by Professionals and Parents.

9.1.1 The Curriculum.

It was considered important that the physical education specialists and class teachers involved in the programme were made aware of the philosophy and objectives of physical education in the primary school as promoted by Renfrew Division. This was achieved at pre-programme meetings when the results from research into primary physical education, already carried out in the division (Queen, 1979), were discussed with the teachers.

The emphasis in the physical education programme was placed on encouraging children to acquire a love of physical activity and to participate in a wide variety of activities including those which they could continue throughout life. To achieve this, the accent was placed on providing time for physical activity during the school day, making exercise fun, and helping the children to become physically competent and confident in their own ability.

In the Pilot Study the class teacher interviewed each of her children individually at the end of the programme. The children themselves felt that the broad programme gave them the opportunity to select the activities which they preferred. Although not all children liked all activities their preferences covered the full range within the programme. There was no differentiation between activities for boys and girls and in their interviews with the class teacher many of the girls chose football as their favourite activity. Enjoyment and success were the two main reasons given for preferring one activity to another. Many of the children had continued to pursue activities, outside of school, which they had experienced for the first time in the programme. They all stated that they felt fitter by the end of the year.

The breadth of programme was maintained in the Linwood Project. The curricular evaluation of content from the Pilot Study was influential in the planning of the expanded project. The suitability of content to the child's developmental age was recognised. The intention was to provide activities which would encourage functional development and those which would involve the acquisition of skills. The need for pre-adolescent children to engage in creative and exploratory activities was also re-emphasised.

Physical education can also be a vital agent in the development of favourable attitudes towards social and health education. The activities associated with physical education frequently place children in highly charged emotional situations. In the Pilot

Study and Linwood Project the children were placed in situations which required co-operation. There were also situations where the children competed against themselves and against others as individuals, with partners or in teams.

The daily physical education programme was seen to provide a constructive outlet for children who lived in difficult home circumstances and who exhibited tension and aggression. Several head teachers had commented that since their schools had become involved in daily physical education there had been a decrease in instances of indiscipline, especially in the playground.

Competition in the Pilot Study and in the Linwood Project took many forms. The over-riding consideration was to safeguard the best interests and welfare of the children and to avoid pressure, stress and 'win at all costs' attitudes which have been evident in children's sport. Some parents, coaches, club officials and teachers, albeit unwittingly, have exploited children for their own ambitions and fulfilment (Sandstrom, 1974). Competition for children can produce undue stress and be psychologically damaging. However, it is not competition itself which is a problem but the way in which it is presented to children. In this study the following considerations were of uppermost importance: careful grouping of children to avoid maturational mismatching; learning of motor skills; fitness; fun and purpose; success; rules made for and by the children; suitable equipment for primary children.

The philosophy adopted by the teachers towards competition throughout this study was to promote: participation by all in a variety of activities; respect for others; opportunity for all to succeed; development of skills; the co-existence of co-operation and competition; winning and losing graciously; appreciation of others, whether colleagues or opponents, regardless of the outcome of their performances. Roberts (1980) identified the four most common elements used to explain the causes of winning and losing as: ability, effort, luck, and difficulty or ease of task. An awareness of these factors assisted the teachers in this study to evoke appropriate responses from the children. The teachers considered it important to give positive reinforcement to all of the children. They recognised that through sports children compare themselves with others and obtain important information about their own relative competence and self-worth. Harris (1973) found that a sense of successful participation in physical activities promoted a positive body image which in turn made the individual more inclined to participate in physical activities throughout life. The teachers in the Linwood Project were striving to provide a programme which would permit every child to develop a 'positive body image'.

Although competition existed through the usual extra-curricular and inter-school competitions, there were opportunities for all children to engage in competition within the school, and in intra- and inter-school festivals of sport. This 'festival' approach encouraged participation by all children in a wide variety of activities with the emphasis on participation. In inter-school festivals which involved team activities, the teams were mixed in terms of schools and sexes, and every child participated. A team of five consisted of one person from each school (regardless of religious denomination) and had three of one sex and two of the other. The adult role was supervisory, and administration and officiating were conducted by the children. There was enthusiasm about the success of the festivals of sport which one head teacher claimed had produced some of the most effective primary/primary and primary/secondary liaison she had ever seen. (Campbell, 1985) (appendix E)

On completion of the Pilot Study all of the children on the daily physical education programme wanted it to continue the following year. The same view was expressed by the children in each of the schools in the Linwood Project.

The Linwood Project was action research and as such was under constant scrutiny. In the middle, and at the end of each year of the project, the objectives of the daily physical education programme were formally evaluated by the teachers from the two secondary schools, representatives from their associated primary schools and the co-ordinator. During the project there were diverse views expressed by the teachers in terms of the balance and relevance of aspects of the programme. These issues were examined and discussed by all concerned and cognizance was taken of each issue in the planning and implementation of the programme. At the end of each session the specialists and the class teachers evaluated the programme and considered whether the objectives embracing breadth, balance, differentiation, progression and relevance in the physical education curriculum had been satisfactorily achieved.

The work of the physical education programme and the classroom curriculum were closely but naturally linked. Physical education was used as a learning medium in developing concepts and understandings in other curricular areas. This integration was considered a vital component in the evaluation of the programme. The specialist teachers of physical education, in particular, were surprised by the amount of technical information, related to physical education, which the children had acquired during the programme. In addition to the development of the skilful and competent use of their bodies, teachers reported that the integrated curriculum motivated children to become increasingly interested in aspects of classroom work which related to physical activity. The children were encouraged to become 'teacher independent' and to take responsibility for their own actions. There was evidence that they had developed knowledge and understanding through physical education.

At the end of the school session, all of the head teachers confirmed that the programme had provided stimulation and motivation for work in other areas of the curriculum, and had provided relevant and meaningful contexts for a great deal of classroom activity. They felt that the result was a much more refined and better balanced curriculum, with every subject having clearly understood aims and objectives.

9.1.2 Class Teachers.

On completion of the first year of the Linwood Project the class teachers' comments were collated. They responded positively to the daily physical education programmes in terms of their children's attitude and behaviour. They reported that: there was increased enthusiasm to school and school work; discipline had improved; there was greater co-operation between children; the programme had a positive influence on the children's tolerance of the less able.

Almost all class teachers were concerned about the allocation of time to physical education in the early stages of the programme. One teacher reported that in term 1 she had reservations about how much time was being spent on physical education, but that her 'opinion changed greatly' and that she wished to continue with a daily programme. Another reported that she was surprised that she had enjoyed the programme so much, putting this down to the enthusiasm of the children being infectious.

It was found that it took from two to three months, for most teachers who were new to the programme, to become accustomed to the increase in physical education time and to re-adjust time for other areas of the curriculum. With few exceptions class teachers reported more direct teaching than before, more group teaching than before, and more efficient teaching. The direct teaching did not mean more didactic teaching, but that the children were spending less time in text book learning. All felt that language and number work had progressed satisfactorily.

The increase in physical education time was not to the detriment of any particular subject or groups of subjects. Teachers considered that the reallocation of time was compensated for by more efficient and relevant teaching.

All class teachers had commented upon the benefit of having guidelines in physical education which were clear, comprehensive and practical. They stressed that without them they would have had difficulty in following the specialists' lessons and doubted if they would have been able to implement the daily physical education programme. Those class teachers who had more experience of the programme, or of particular aspects of it, found that the guidelines were useful as a handrail which they could refer to if and when necessary. All teachers were encouraged to evaluate the lessons in the guidelines when they had used them. This ensured that the guidelines were regularly monitored and updated.

The class teachers commented both upon the positive reaction of the children to working with specialists and to their own pleasure of working in a team where their knowledge of the children blended with the specialists' subject knowledge. All teachers changed into appropriate clothing for physical education and many participated with their classes in practical activities. Some teachers found that the children had more respect for the teacher if she participated in the lesson. Shephard (1982) has stated that if children are to become more active they must sense a commitment by adults to an active lifestyle. Class teachers found that the children accepted that it was not necessary for the teacher to be knowledgable or physically competent, and that they and the teacher were learning together. However, the enthusiasm of the class teacher was important to the success of the programme with her class. Zaichkowsky et al. (1980) noted that when children had developed positive or negative relationships with their teacher, they perceived and judged the teacher's behaviour in ways consistent with their attitudes. Several teachers participated in recreational activities as a result of their involvement in the programme.

The co-operation and guidance of the advisers in primary education were important to the implementation of the daily physical education project. Their advice and availability were valuable to the class teachers, particularly in the early stages of programme planning. They were supportive throughout this daily physical education programme.

9.1.3 Specialists in Physical Education.

In the Linwood Project the specialist teachers were members of the physical education departments from the two associated secondary schools. All members of the two departments had timetable commitments in their associated primary schools. The specialists have been very positive in their evaluations of the project. They have been conscious of the improvement in the physical ability of the children who have been part of the daily physical education programme. They found that, on entry to secondary school, the children: were more skilful than their predecessors; had a better attitude to physical education, particularly the girls; settled in more quickly since they were acquainted with some of the secondary staff.

The physical education programmes in the two secondary schools had to be re-organised because of the increased competence of the children on entry to first year. One of the secondary schools had to operate a remedial class in physical education to cater for the children who came from a primary school which had not been involved in the project. One specialist who transferred to a school outwith the project commented upon the superior fitness, co-ordination and games skills of the Linwood children over the children in the school to which he had moved. Although he enjoyed his new school he felt that the benefits of the daily physical education programme were even more evident to him now.

The physical education specialists who have been involved in the Linwood Project have shown enthusiasm for the programme and regard it as the natural and desirable progression from the Renfrew Division Primary/Secondary Integration and Liaison Schemes (Queen, 1977; 1979). They have enjoyed co-operatively teaching with the class teachers and their roles as tutors in physical education. They now consider that their professional remit includes the physical education of all children in their catchment area from 5 years to 16+. At teachers' meetings the daily physical education specialists have had opportunities to meet with colleagues and to discuss the project. They have been very persuasive and have convinced many of the need for similar programmes outwith Linwood.

9.1.4 Parents.

At the end of the first year of the Linwood Project all parents of children in primaries 6 and 7 (school A) were asked to complete a questionnaire regarding their child and the daily physical education programme. Of 81 questionnaires issued, 79 were completed and returned (98%) (appendix D). In 89% of returns the parents felt that they had no regrets about the daily physical education year and the programme in which their children had taken part. The comments, from the remaining 7 parents concerned factors over the year which had little or nothing to do with the programme. In response to the question, 'What would you like to happen now regarding your child and the programme?', 94% of the parents wanted the programme to continue. This suggested that the parents of primary 7 children wished the programme to continue into the secondary school in the following year. The remaining 6%, all parents of children due to transfer to secondary school, were 'unsure'.

Most parents commented favourably on their child's behaviour at home (97%). They also felt that their children had a more favourable attitude towards parents (99%), brothers and sisters (87%), friends (100%), and school (95%). A number of parents were optimistic that their children's increased enthusiasm for school would be reflected in their academic performance. Many parents reported that outside of school their children had been more active (51%) and less passive (63%) in the daily physical education year than before. Most parents (87%) felt that their children were fitter than the previous year and the remainder of the parents considered that their children had the same level of fitness (10%) as before or that they did not know (2%). Although 52% stated that they themselves took part in physical activities less than once a month, many (67%) had been encouraged by their child to become involved in physical activity.

In the course of the Linwood Project the co-ordinator was requested to speak with two individual parents on separate occasions. In each instance the parent wanted to be more fully informed of the aims and basis for the programme. Both parents were supportive of the project after the meetings.

9.2 International Comparisons.

It was never the intention of this study to compare the scores from the academic and affective domains with other studies. However, it was the intention to examine the fitness scores with those of other relevant studies.

From a review of the literature it was not possible to find normative data on motor fitness which could have been used to compare the children in this study with children from other parts of Great Britain. Interpretation of data from other countries was complex and in many instances impossible. No one study, national or regional, covered exactly the same test battery as the Linwood Project. Many different problems existed in terms of: a shortage of information on testing and sampling procedures; insufficient statistical information; variations in determining age groups; differences in environmental conditions and work surfaces in the testing of the physical items; motivation of subjects. The existence of any of these factors can have significant effects on results and make reliable comparisons impractical. Consequently analysis was limited to the superficial comparison of mean scores from testing which appeared to have been conducted on similar lines to this study.

It is necessary to re-emphasise the limitation of this approach, and that interpretation was restricted to the identification of possible trends.

Recent national studies were used: the CAHPER Fitness-Performance II Test (1980), the National Children and Youth Fitness Survey (Ross et al., 1985) and the 1985 Australian Health and Fitness Survey (Pyke, 1986).

Appropriate international studies, which were of a regional or local nature, were also used for comparative purposes. These included fitness assessments from Manitoba (LaPage and Gutoski, 1978), Saskatchewan (Ellis et al., 1975), Vancouver (Sinclair and Appleby, 1979), West Germany (Schneider, 1986), France (Adam et al., 1981), and Israel (Ruskin, 1978). The mean scores from the NCYFS and Australian surveys and the Israeli study had to be estimated from figurative data.

The mean scores for boys and girls from all of these studies were tabulated and placed alongside the scores from this study (tables 9.1, 9.2).

The Linwood children were divided into Model 1 (primary 6), Model 2 (primary 7) and Model 3 (primary 7 children with two years experience of daily physical education). Each model had a pre- and post-programme score at the appropriate stage.

Boys

	Age	Mod1	Mod2	Mod3	CAHPER	NCYFS	AUST.	MAN.	SASK.	VANC1	VANC2	W.G.	FRANCE	ISRAEL
	9	2.92			2.88								2.88	
Shuttle run	10	3.11	3.04	3.00	2.96								3.19	3.08
(m/s)	11		3.29	3.10	3.05								3.24	3.13
	9	142			136		142			141			145	132
Standing long jump	10	149	147	150	146		147		164	154	159		150	143
(cms)	11		156	157	154		150		169		166		159	155
	9	29.9			33.4			35						
Sit ups	10	35.1	30.5	41.2	37.9	34.4		37	37.8			30.7		
	11		36.9	39.5	37.9	35.8		36	39.4			29.7		
	9	30.4			30.8			28		27.4				
Flexed arm hang	10	35.6	31.8	37.5	32.9			31	30.6	30.6	28.0			
(secs)	11		43.0	48.9	36.0			31.6	36.1		31.7			
	9	5.28			5.05		5.56							5.08
50 metre run	10	5.61	5.33	5.57	5.26		5.58							5.26
(m/s)	11		5.68	5.89	5.43		5.95							5.56
	9	3.02					3.07							
Endurance run	10	3.35	3.37	3.22	2.78	2.44	3.20	2.96				2.89		
(m/s)	11		3.66	3.40	2.88	2.57	3.20	3.02				2.84		
	9	17.5					17.0	17.4		18.8				
Flexibility	10	18.5	17.1	20.1		18.6	16.5	18.4		18.5	19.8	16.9		
(cms)	11		18.8	19.0		18.6	16.2	17.7			18.5	16.3		

Table 9.1 International comparisons of physical fitness mean scores (boys).

At pre-programme testing, before any intervention, the 'Daily P.E.' boys of Model 1 had the highest shuttle run and lowest sit-ups mean scores of all studies at that stage. The boys in Model 1, at post-programme, were superior to the boys (10 years old) in all the other studies on flexed arm hang, 50 metre run and endurance run.

At pre-programme in Model 2, before intervention, the 'Daily P.E.' boys had superior mean scores to the boys in all other studies (10 years old) on endurance run and inferior mean scores to all other studies on sit-ups. At post-programme the 'Daily P.E.' boys were superior to the boys in all other studies (11 years old) on shuttle run, flexed arm hang, endurance run and sit and reach (flexibility).

In Model 3 at pre-programme the 'Daily P.E.' boys, with one year's experience of daily physical education, were superior to the boys (10 years) in all other studies on sit-ups, flexed arm hang, endurance run and sit and reach. At post-programme the 'Daily P.E.' boys of Model 3 (11 years old) were superior on sit-ups, flexed arm hang, endurance run, and sit and reach.

Before the intervention programme the 'Daily P.E.' girls in Model 1 were inferior in mean scores to the girls in other studies (9 years old) on sit-ups,

Girls

	Age	Mod1	Mod2	Mod3	CAHPER	NCYFS	AUST.	MAN.	VANC1	VANC2	W.G.	FRANCE	ISRAEL
	9	2.86			2.78							2.99	
Shuttle run	10	3.14	2.96	2.90	2.86							3.11	3.03
(m/s)	11		3.21	3.11	2.96							3.23	3.10
	9	135			132				133			134	126
Standing long jump	10	148	139	147	140		132		138	143		144	140
(cms)	11		149	155	149		140			142		154	145
	9	23.6			31.4			31					
Sit ups	10	32.4	24.5	37.3	33.8	31.4		33			27.6		
	11		31.6	40.4	34.6	31.6		35			26.8		
	9	17.5			22.1			19	17.5				13
Flexed arm hang	10	27.6	17.8	30.0	22.4			21.5	24.5	24.2			10
(secs)	11		25.5	37.0	23.6			24.0		29.6			11
	9	5.06			4.95								5.35
50 metre run	10	5.40	5.16	5.34	5.05		5.43						5.43
(m/s)	11		5.58	5.73	5.26		5.46						5.43
	9	2.64					2.69						
Endurance run	10	2.94	2.90	2.79	2.41	2.31	2.78	3.00			2.56		
(m/s)	11		3.18	2.97	2.49	2.26	2.78	2.74			2.58		
	9	19.0					21.5	20.9	21.4				
Flexibility	10	20.6	18.8	24.0		22.1	20.5	20.3	21.2	21.6	20.1		
(cms)	11		20.4	22.5		23.1	21.0	20.8		22.3	20.9		

Table 9.2 International comparisons of physical fitness mean scores (girls).

endurance run and sit and reach. At post-programme in Model 1 the 'Daily P.E.' girls (10 years old) had superior mean scores to the girls in all other studies on shuttle run, standing long jump and flexed arm hang.

At pre-programme in Model 2 the 'Daily P.E.' girls had lower mean scores than the girls in all other studies (10 years old) on sit-ups and sit and reach. At post-programme the 'Daily P.E.' girls were still poorest on sit and reach but were superior to all other girls on 50 metre run and endurance run.

In Model 3, at pre-programme testing the 'Daily P.E.' girls were superior to the girls in all other studies on standing long jump, sit-ups, flexed arm hang and sit and reach. At post-programme testing, in this model, they were superior to the girls of all other studies on standing long jump, sit-ups, flexed arm hang, 50 metre run, and endurance run.

While exercising caution in the interpretation of the mean scores at the different age groups, it did appear that the intervention of the daily physical education programme had a positive influence on the physical fitness scores of the Linwood children in relation to the children in other countries.

CHAPTER 10.

Discussion.

There have been other studies into the effects of daily physical education programmes on primary children. However, many of the studies were of short duration or were observational with no control groups. Some studies had tested in either the physical, affective or intellectual domains, or in combinations of the three. However, all studies in daily physical education were conducted in countries outwith Great Britain.

The interrelationship and interaction among the physical, intellectual and affective developments are complex (Harris, 1973). This was borne in mind when the children in the Linwood Project, 'daily' and 'normal' physical education, were tested in the academic, affective and physical domains. The study has been part of a larger concept of physical education and for these reasons has been unique.

The results from the questionnaires, teachers' reports and children's interviews, support the findings which indicated that the children engaged in the daily physical education programme had improved their physical fitness from pre-programme to post-programme and were fitter than the children in the 'normal' physical education programmes, as measured by the CAHPER Fitness-Performance II tests and the test of flexibility (Chapter 5).

The children from the Linwood Project, who engaged in the daily physical education programme, did not practice the fitness test battery during the programme. However, since the objectives of the programme included development of motor fitness the daily physical education children were engaged in activities which should have influenced their scores at re-testing.

Before engaging in the daily physical education programme the children, at 9 years of age, had lower scores on abdominal strength, cardio-respiratory endurance and flexibility (girls) than their peers in other studies (tables 9.1, 9.2). Before the commencement of the programme the Linwood daily physical education children, at 10 years of age, had lower scores on abdominal strength and flexibility (girls) than children of the same age in other countries. At post-programme in primary 6 and primary 7 the Linwood children had improved and were superior to most other studies on most items. Contrary to expectations the Linwood children had better endurance run scores than most other studies before and after the programme. This may have been due to superior cardio-respiratory endurance in the Linwood children or to the fact that testing took place after the summer vacation when children tend to be most active. This finding highlights the need to standardise the timing of tests and age groupings when comparing different studies.

From the results in Model 3 it would appear that inferior scores by girls in fitness tests could be more socially induced than genetic. The girls engaged in daily physical education followed the same programme as the boys and after two years had similar and better scores in the fitness tests than the boys of both groups on many items. These girls had superior post-programme scores to the 'Normal P.E.' boys on all items except endurance run. One reason for this may have been the result of increase in fat tissue from the onset of puberty in the girls. Zaichkowsky et al. (1980) felt strongly that if the two sexes received the same opportunities for participating and training as well as the same social acceptance, there would be no sex differences in physical performance throughout childhood and early adolescence.

There were problems with certain aspects of the test battery which should be avoided in future research in this area. While the field testing in the physical fitness domain was adequate the inclusion of anthropometric measurements throughout the project would have been valuable. The results from the skinfold measurements in the Pilot Study indicated interesting trends. The comparison of figures from the Pilot Study with the results from the 1972 study by Rona and Altman (1977) supported fears that present day children could be more obese than their predecessors. The inter-relationship of obesity and physical inactivity would appear to have been demonstrated since the results from the Pilot Study suggested that the daily physical education programme had a positive effect on reducing body fat. It is unfortunate that there are no anthropometric data available from the Linwood Project.

In the Linwood Project the physical educationists were aware that they had a responsibility towards the health and fitness of their pupils. The incidence of major musculosketal injuries among children engaged in sport is high (Shephard, 1982). There is little evidence to suggest that vigorous training has a harmful effect on normal children. However, the overstressing of immature bones, between the epiphysis and the shaft of long bones, can cause serious injuries. This has been mainly associated with children who have shown an aptitude in a particular sport and have been subjected to frequent and intense competition in that activity. There is no evidence to suggest that such injuries can occur from balanced physical education programmes. However, the specialists and class teachers in the

Linwood Project were conscious of possible injuries and carefully monitored any illnesses or injuries sustained by their pupils. Despite an increase in the frequency and intensity of physical activity there were no instances or reports of the daily physical education programme having harmful effects on the children.

With the gradual transfer of responsibility from the specialist to the class teacher it became apparent to the researcher that less time was being spent in vigorous activity during parts of the lesson specifically designed to concentrate on cardio-respiratory development and muscular endurance. There were similar findings by Cureton (1964), Boyer and Wilmore (1977), Hale and Bradshaw (1978), Goode (1979), Seliger et al. (1980), Shephard et al. (1980), Dwyer et al. (1982). Some of the children experiencing a second year of daily physical education were taught aspects of the programme by their class teachers. This may be a more probable explanation for the disappointing scores in endurance run by the girls in the 'DPE2' group as against the scores of the 'DPE1' and 'Normal P.E.' children.

Since the battery of tests devised to measure changes in motor development was discarded, subjective judgements were considered. The specialist teachers of physical education who had been involved in the programme endeavoured to ensure that the children were having the opportunity to acquire motor skills in a wide variety of situations. They were convinced that the children were fulfilling their potential in motor skill development. Teachers noticed that children who enrolled in the Linwood schools in mid-session lacked familiarity with the physical education setting and were remedial in physical skills by comparison to the daily physical education children. The necessity to completely re-design first year secondary physical education programmes was an indication of a positive change in the skill level of the children on entry to secondary school. The introduction of remedial classes in one of the secondary schools for children outwith the project (9.1.3) has also indicated the positive motor skill improvement by the daily physical education children. Visitors to the project, from this country and abroad, have formally and informally suggested that the children in this study appeared superior in motor skills to 'normal' children of the same age. Visitors also commented favourably upon the wide variety of activities in which the children were engaging. The children in this study were recognised as being physically literate.

The children took pleasure in having responsibility for the preparation and implementation of their own physical activity. The teachers encouraged them to: prepare warm ups; organise, administer and officiate games and sports; be involved in creating and displaying their activities. Mosston (1966) has claimed that true learning can take place only if and when the child has some control over decisions permeating the learning situation. The classroom work also reflected the depth and quality of knowledge and understanding which the children had acquired into different aspects of physical education and health (9.1.1).

The head teachers and class teachers shared the parents' optimism about the influence which the programme had on the children's academic performance. The results from the academic testing indicated that the children who had engaged in the daily physical education programme had not fallen behind their peers in the 'normal' physical education groups, in reading comprehension and computation, despite spending more time on physical education. The results from the test of computation indicated that the children in the daily physical education programme at primary 7 had made greater progress than the children at the same stage in the 'normal' physical education programmes.

This may have been the result of an acceleration of psychomotor development and self-perception (Shephard, 1984) or due to more practical and relevant mathematical experiences giving stimuli in meaningful contexts. Coonan et al. (1979) found in their study that there was no adverse effect on academic achievement and that arithmetic scores were in favour of their 'fitness' group. Ismail and Gruber (1967) suggested that differences in intellectual achievement may be the result of exposure to a better physical education programme which develops and achieves a better neurological basis for learning through two approaches, classroom and gymnasium programmes.

From as far back as the early Greeks, educators and philosophers have felt that enjoyable *physical activities* at school have positive influence on the child's attitude to going to school, discipline and learning. The parents and teachers felt that the improvement in attitude to school would be reflected in the academic results (9.1.4). Some head teachers and class teachers stated that regardless of the outcome of the standardised tests they knew that the quantity and quality of work carried out by the children was better in the programme year(s) than before.

Whatever the reason for the results from the academic tests, in particular the computation scores at primary 7, there does appear to be a relationship between vigorous exercise and a feeling of alertness and efficiency in handling a day's activities. Perie (1969, cited in Bailey, 1976) claimed that the improved academic performances in the Vanves Experiment were not due to the children being more intelligent as a result of the programme, but that the tools of intelligence were much keener.

It was unfortunate that the socio-economic background of the children was a factor in the interpretation of the academic results. A decision was made by Renfrew Division to include all primary schools associated with the two Linwood secondary schools in the Linwood Project. For this reason School F was included in the original study in circumstances outwith the control of the researcher. Although the sample became small and analyses more complex, with the removal of the higher socio-economic group, the indications were that the daily physical education children appeared to have progressed to a greater extent than the remaining children from the similar socio-economic background. It is conceivable that with a larger sample of children from matched socio-economic status and milieu, the academic findings could have been more emphatic.

Head teachers, class teachers, parents and children, have remarked on an apparent change in attitude to school by the children engaged in the daily physical education programme. At first sight the results from the attitude questionnaire seemed to suggest that the change had been a negative one since the children in models 2 and 3 had decreased mean scores in 'School Related Attitudes' from the pre- to post-programme stage. However, there is considerable evidence from the literature to indicate that a deterioration in children's 'attitude to school' at the end of the primary stage is common. What is important in this study is that the daily physical education children had superior scores to their peers in the 'normal' physical education classes. The daily physical education children commented upon looking forward to going to school each day because of the physical education programme. The more favourable attitude to school by the daily physical education group in this study was not reflected in improved attendance and there were no changes in the three models at the 0.05 level of significance. Although regular exercise programmes for adults appear to reduce absenteeism, Shephard et al. (1982) found that school programmes with the same emphasis, regular physical activity, did not improve children's attendances.

In addition the daily physical education children had more positive scores on 'Pupil's Personality' than the 'normal' physical education children in Models 1 and 3. This is consistent with the head teacher and class teacher reports relating to increased co-operation and greater esprit de corps in the daily physical education classes. It was difficult to explain the lower mean scores in Model 2 in 'Pupil's Personality'. On further examination of the scales which contributed to this cluster it was clear that the daily physical education children had higher scores on 'teacher relationship' for boys and girls. The daily physical education girls had better academic self-image than the girls in the 'normal' physical education group. However, the 'normal' physical education group were less anxious in class and had better social adjustment than the daily physical education group. In Model 2 the superiority of the 'Daily P.E' group on one cluster and the 'Normal P.E.' group on the other cluster was similar to the findings of Barker Lunn (1972) between boys and girls. She suggested that the group with better school related attitudes were more involved with their school and teacher, and aimed to please. Consequently they felt more anxious, set themselves a higher standard and judged themselves more harshly than the other group.

Barker Lunn (1970) found that teachers tend to have a less favourable attitude to duller pupils, that this was related to the pupil's self-esteem, and that when a teacher tended to dislike the less able, the class tended to follow. Throughout the Linwood

Project teachers commented upon the improvement in social acceptance and improved self-esteem of children who had shown little ability or success in the classroom. Many of the children who were less able in the classroom were seen by their teachers to perform better in the physical setting. This new respect may have been transmitted to the child and to the rest of the class. It appeared that the other children were becoming aware of qualities in these children which were not apparent in classroom activity. One of the teachers' roles is to aid the child in emotional growth and in the development of his own physical image rather than mandating an image created by the teacher (Zaichkowsky et al., 1980). It is important for the teacher to recognise the potential which physical education has in the development of positive self-concept (9.1.1). In the course of the project some class teachers encouraged their pupils to be responsible for leading parts of the physical education lesson with their class. This was a most popular and productive part of the project. While some children were more adept than others, the teachers reported that they all wanted to be in charge, and enthusiastically awaited their opportunity to prepare and lead the lesson. Martinek et al. (1977) found that when children were given a say in the decisions concerning the operations of the physical education class they were able to develop a more positive self-concept. This should be an important objective of physical education programmes.

While frequency, intensity and variety are necessary it is well documented that the most important factor in effective physical education programmes is the quality of teaching (Wearring, 1981; Coonan et al., 1982). This is even more pronounced in a daily physical education programme. In this study the relationship between class teacher and physical education specialist was critical. Many studies have reported classroom teachers or itinerant specialists having responsibility, or sharing responsibility, for the physical education curriculum. Experience has shown that the programmes tended not to be relevant to the secondary programme and that the itinerant teachers felt little relationship between themselves and their primary schools. The class teacher often regarded the specialist's visit as an opportunity to catch up on classroom preparation, as an opportunity to undertake other tasks, or to passively watch the lesson. The lessons taught by class teachers were generally of a low standard and tended to be more concerned with allowing the children to 'let off steam' or as a break from classroom activity. It does seem rather negligent to be haphazard in the quality, quantity or indeed occurrence of a systematic physical education programme in the early years. While there is a considerable amount of sympathy for the primary teacher in the implementation of the necessary programme it is essential that the needs of the child are a priority.

The approach which involves the class teacher working with the specialist teacher from the associated secondary school appears to have many advantages over all other practical alternatives (9.1.2). In this study the association of the secondary school with its feeder primary schools ensured that there was continuity of programme between the primary and secondary school and ensured similarity in physical education programmes across the primary schools. Specialists and class teachers became members of larger teams which encouraged communication and co-operation and removed the isolation which is often a feature of primary school teaching. The teachers could relate to each other and the children much more closely, and the transition from primary to secondary was much less daunting for the children. There was coherence, continuity and progressiveness in the programme, all features recommended in the 'Education 10-14 in Scotland' Report (Consultative Committee on the Curriculum, 1986).

The sharing of physical education lessons, and occasionally classroom lessons, was considered a most successful and rewarding aspect of the programme. This intervisitation helped make the programme more coherent for the pupils. There were many examples of physical education being used as a learning medium in other curricular areas, as the focus of a classroom project, or as a practical outlet for classroom work. Studies involving health education provide the most obvious examples of physical education being used as a learning medium across the curriculum. The approach used was similar to the 'Body Owners' Project (Worsley and Coonan, 1982) in which the children find out about healthy living through a classroom project and through *self-monitoring health behaviours*. In the Linwood Project, topic studies like 'Billy Hughes' (Strathclyde Regional Council, 1980) assisted the daily physical education children to become knowledgeable about healthy living and concerned about their own lifestyles and of those around them. Reports from teachers and parents indicated that this approach had a positive influence on the attitude and behaviour of their children and themselves (9.1.2, 9.1.4).

Before engaging in the programme the physical education specialists were recommended to concede that they did not have sufficient knowledge or experience of primary school physical education and the maturational levels of primary school pupils. This enabled specialists and class teachers to accept a learning partnership which would be to their mutual advantage and to that of the children. It was important to accept that there were no experts.

Major studies have recommended that there should be administrative and advisory support for the teachers in order to produce quality programmes of physical education. In this study the guidelines which had been produced for primary/secondary integration were very important to the success of the co-operative teaching approach. However, daily physical education is very consuming of content and there was constant demand for more material. The programme expanded each year and included new activities like skiing, canoeing and sailing. Video films were produced which included the philosophy, content and methodology of aspects of the programme (Jordanhill College of Education, 1986).

As the class teachers became more confident and gained expertise they relied less on the specialist and became more independent. This cycle was completed within the Linwood Project (9.1.2). Initially the physical education classes were the responsibility of the specialist with the class teacher observing. As the programme progressed the class teacher assumed increased responsibility and a co-operative teaching approach was reached with the specialist's role changing from tutor to consultant.

The specialist always worked at the pace of the class teacher. When the class teacher felt able to work independently the specialist moved to another class further down the school but was always available for consultation or practical assistance if required. With the transfer of teachers across the different stages of a school, the arrival of new staff, and the need for curriculum development, specialist assistance will always be required in the primary school.

The co-operative teaching approach and curriculum guidelines helped the teachers overcome lack of confidence and the fears normally associated with an increase in time to physical education and reduced time to other areas of the curriculum. The re-allocation of time in the Linwood Project by the class teachers was similar to that found in Dodd's (1984) South Australian survey. Most of the time came from a re-organisation of the total timetable and partly from a small reduction in time from several other subjects.

While many teachers have preferences to certain activities over others, the balance and breadth of the programme were constantly under review. Research has shown that class teachers tend to favour teaching games and sports rather than gymnastics and dance (Wilson, 1975). This could be due to the difficulty of the child-centred, open-ended approach in activities which are more aesthetic and expressive and because the teacher often may not have a clear understanding of what to expect from the children in these areas. This insecurity tends to make teachers resistant to teaching these activities. Both of these aspects were closely scrutinised in the programme. The fear of gymnastics was reduced by the explicit guidelines. However since dance was found to be an area of difficulty for many class teachers and specialists, tutorial assistance was provided for them.

The emphasis on the Expressive Arts in national documents, reports and in pre-service teacher training, has created confusion as to the aims and purposes of physical education in the primary school. The characteristics which were considered in 'Learning and Teaching in Primary 4 and Primary 7' (Scottish Education Department, 1980) to be common to other subject areas (expressive movement and dance) and which made it convenient to treat them as a group, were cited in that Report as being neglected in favour of gymnastics, sports and games. The 'Education 10-14 in Scotland' (Consultative Committee on the Curriculum, 1986) Report identified two 'Aspects of Experience' which related closely to physical education in the primary school: 'Physical Health and

Well-being' and 'Expressive and Appreciative Activity'. The latter aspect embraces those elements of the physical education programme which make valuable contributions to the expressive arts, whereas the former recognises that there are other elements of the physical education programme which are important to the total growth and development of the child and are not closely associated with art, music and drama. This separation could help clarify in the teachers' minds the different objectives of physical education.

In the Linwood Project, as soon as the class teachers became aware of the objectives of physical education in the primary school they became more committed to its inclusion as a vital part of the curriculum (9.1.2). It could be expected that with this awareness the 'weekly' lessons referred to in the 'Primary 4/7' Report would be considerably increased.

It was the intention of this programme to encourage children to participate in physical activity, in and out of school, and to develop the activity habit (9.1.1). In the first year of the Linwood Project the manager of the local sports centre was not aware of an increase in the use of the facilities by the children in the community. However, in the second year, when every child at primary 6 and primary 7 in the town was engaged in the project, the manager noticed an upsurge of interest and enrolment in courses, and of use of facilities by these children. Most parents stated that their children were more physically active outside of school, as a result of the programme, than before (9.1.4).

Within Renfrew Division there is an opportunity for children and adults to join centralised schemes which have been in operation in Renfrew Division of Strathclyde Region for over 15 years and cater for in excess of 10,000 pupils in 40 centres and in 12 activities. These are administered by teachers and offer participation for all at their own level of ability from experiential to top class competition. Any activity which the school offers to the child is also available within that community, outwith school hours, through the centralised schemes. Any child who had an interest in a particular activity has the opportunity to develop his/her potential to the full. The children in the Linwood Project were informed about the schemes and many became involved in them. Some parents and teachers admitted to being influnced by the programme, to becoming more active themselves, and to being more aware of the benefits of healthy living (9.1.2, 9.1.4).

Martens (1975) has stated that parents who value physical fitness and are interested and engage in physical activity, will encourage their children to become more interested and competent in physical activity. However children may well develop negative feelings towards being active if parents pressurise them into participating in activities which are unenjoyable, stressful, or where the child does not experience success. Boyer and Wilmore (1977) claimed that the best way to teach lifelong physical habit patterns was for the family to engage in activities together. This could be done if parents were able to create a family-oriented approach to exercise. The findings from the questionnaire in the Linwood Project suggested that it could be possible for children engaged in a daily physical education programme to positively influence the attitude and involvement of their parents in physical activity (9.1.4).

All parties involved in the daily physical education project expressed a desire to see the programme continue. This was the finding of similar research in Canada (Wearring and Banting, 1977; Wearring and Heale, 1978; Martens and Grant, 1980; Rothman and Byrne, 1981).

It would appear that the children engaged in the daily physical education classes have experienced an effective programme and that the objectives of the project were met. The findings from the Linwood Project indicated positive psycho-physical effects on the children engaged in the daily physical education programme.

Chapter 11.

Implications for the Future.

Introduction.

The Pilot Study and Linwood Project were introduced into the schools before the industrial action started in 1985. Although this action precluded teachers from undertaking developmental work, the Linwood Project had already been accepted as an integral part of the schools' functioning and has become 'institutionalised' in the Linwood schools. Consequently the programme continued. However, at the time of writing, daily physical education had not been expanded outside of the town of Linwood. Nevertheless planning for future development has been made and, with the end of industrial action, will be put into effect.

The aims of the daily physical education programme at Linwood are still appropriate to similar programmes in the future. However, the experience gained from successful and unsuccessful aspects of the Linwood Project, together with the other research developments in Renfrew Division, allow recommendations and implications to be made for future developments in daily physical education.

11.1 The Linwood Model of Staffing Daily Physical Education Programmes.

The Linwood Project consisted of daily physical education classes at primary 6 (10 year olds) and primary 7 (11 year olds) stages of primary school. The programme did, however, extend further down to the younger stages in almost all 5 schools. Two schools implemented daily physical education classes throughout the entire school. However, these classes were not monitored by objective tests. As the class teachers in the upper school became more experienced and more independent in aspects of the physical education programme the specialists gave increasing assistance to the classes lower down the school, working from the oldest children to the youngest (Chapter 10). In the extension of the Linwood Project the specialists have progressed down the primary schools, encouraging and supporting teachers to increase their allocation of time to, and improve the quality of their programmes in, physical education. This stage was reached after the completion of the formal examination of the Linwood Project and did not interfere with the research design.

The spread of support down the primary school years is more difficult than an expansion of the daily physical education programme in the early secondary years. The continuity of programme is relatively straightforward in the transition from daily physical education in the primary school to first and second year in the secondary school. The facilities are already in existence and the physical education staff are familiar with the children on entry to secondary school (9.1.3). If daily physical education was a reality throughout primary school and in first and second year of secondary school the children should be sufficiently physically educated to make informed and appropriate lifestyle decisions about their future in physical activity. The years from 10-14 should be considered the highest priority in the development of daily physical education.

Children who are educated physically require facilities and opportunities to engage in physical activity outwith school hours. It is important that resources are available to them. If possible the activities should be co-ordinated to link primary and secondary schools to appropriate community programmes. The centralised schemes which already exist in Renfrew Division of Strathclyde Region highlight one way in which an individual can attain his/her potential in particular activities at their own level and in their own community (Chapter 10). What is important is that the emphasis placed on the positive social and emotional development of the child in school (Chapter

10) is continued in the community setting. The co-ordination of school and community should be considered a most important factor in influencing all children. Physical educationists have administrative and instructional responsibilities within the centralised schemes which provide a link from school-centred activity to existing local clubs in the national structure of the sport (Pollatschek et al., 1986).

To achieve maximum efffectiveness in the implementation of daily physical education it is recommended that the programme is co-ordinated by the secondary school with its associated primary schools. *To take full advantage of the* involvement by secondary specialists in the development of daily physical education, the obvious progression would move from: a) an isolated primary school responsible for its own *physical education programme (2-3 times per week)*; b) primary/secondary liaison in physical education (2-3 times per week); c) primary/secondary integration (2-3 times per week); d) daily physical education at primary 6 and 7. Eventually daily physical education should spread from the upper reaches of the primary school downwards to the younger classes and upwards to the first two years of the secondary school. The natural expansion outside of the Linwood Project would be to link the daily physical education programme to schools which are already involved in primary/secondary integration. As the class teachers in these schools gain expertise and confidence they can gradually progress towards a daily physical education programme.

While the Linwood Project is contained within a community there are several primary schools, spread across the country, engaging in daily physical education or daily physical activity programmes. Some of these schools have used the Linwood Project as the trigger for their own programmes. There have been instances of other schools, in this country, which have enthusiastically initiated daily physical education without the specialist support recommended in the Linwood Project. From information gathered by this researcher, these latter programmes have lost momentum and have been discontinued by disenchanted teachers who, subsequently, have reported negative feelings towards physical education. Unless there is considerable support for the class teacher(s) it is unlikely that a daily programme can be sustained and it is almost certain that the programme will lack breadth and quality. While there may be regional or national differences to the Linwood Model of staffing, it is highly recommended as being one way of almost ensuring a lasting and high-quality physical education programme. The Linwood Model stresses breadth, balance, relevance to maturational development, differentiation, coherence, continuity and school-focused in-service training. A thorough search and review of the literature has failed to identify a more suitable method of achieving the factors aforementioned than the Linwood Model of staffing daily physical education programmes.

11.2 The Programme.

The Linwood Project, which concentrated on daily physical education at primary 6 and primary 7, was a broad and balanced programme. The specialist support and detailed curriculum guidelines were essential to the success of the programme and helped the class teachers overcome the anticipated initial problems of lack of confidence and concern about increased time afforded to physical education and its effects on time allocation to other areas (9.1.2). As the teachers gained confidence and the specialist support was reduced (Chapter 10), the programme extended to the younger classes. Although the programme in the younger classes was not monitored for research purposes, the empirical evidence gathered by the teachers of the younger children suggested there were similar trends to the findings of the Linwood Project.

To implement a daily physical education programme it is important to have the co-operation of the head teacher, class teacher(s), specialist(s) and parents. All parties need to be fully informed about the aims of the programme. The role of each party also requires explanation and, in the case of the teachers, in-service provision. It is valuable to nominate a co-ordinator who will liaise with the personnel involved in the programme and with those outside of the school(s).

Without the specialist support and appropriate guidelines the programme is almost certain to fail. It is not recommended that primary schools should undertake to implement a quality daily physical education programme without the necessary infrastructure (11.1).

The planning of the programme is the responsibility of the head teacher, class teacher(s), specialist(s) and co-ordinator. Programmes will vary from school to school but it is important that the aims are retained. Overall intentions should be charted for the year in order that resources can be maximised and forward planning made. This does not preclude flexibility within the programme. There is sufficient information from the Linwood Project for daily physical education to be implemented throughout Renfrew Division when the secondary schools and their associated primary schools have undertaken primary/secondary integration.

When a school has reached the stage where it is prepared to implement daily physical education in all classes, the co-ordination of facilities, resources, staffing and support must be carefully planned. Since it is important that there should be continuity from stage to stage within the school, and

Activities	P.1	P.2	P.3	P.4	P5.	P.6	P.7
Active Health / Outdoor Activities / Athletics	40	40	60	60	60	50	50
Games	40	40	70	70	70	60	60
Movement – Dance			25	25	25	25	30
Movement	60	60					
Movement – Gymnastics			25	25	25	30	25
Play	40	40					
Aquatics						15	15
Total Sessions	180	180	180	180	180	180	180

Table 11.1 Recommended allocation of time (daily sessions) to Physical Education in a primary school.

[Note: Approximately 1400 days of activity less flexibility factor (10%) = 1260 days of curricular physical education i.e. 180 days per year.]

from teacher to teacher, there must be an overall plan from primary 1 to primary 7. The head teacher should meet with the class teachers, specialist(s) and co-ordinator at the end of each school year to: evaluate the programme; identify the school strategy; outline the aims for each stage and plan the programme for the following session. An initial working model (table 11.1) has been constructed for the overall allocation of time for a daily physical education programme throughout a primary school (Pollatschek et al., 1985). Although the detail of the distribution of time must be dealt with within each school, it is essential that there is balance and breadth of programme. In the Linwood Project most class teachers preferred their time for physical education to be a combination of mornings and afternoons in any week. The preferences of class teachers are important but are partly pre-determined by the extent to which they rely on specialist support and the timing of the specialists' visits to the primary school.

While it is not impossible to provide a physical activity programme with limited resources, it is necessary to have an adequate supply of appropriate equipment to implement a quality daily physical education programme. This should be based on a range of equipment sufficient to meet the needs of the largest class in the school. While it would be desirable to have all required equipment in each school it may be necessary to have certain expensive items (e.g. crash mats) shared between schools. This would necessitate co-ordination of the programme to allow equal opportunity of use when required. The co-ordinator should have the responsibility of maintaining each school with the necessary equipment to facilitate the implementation of the programme. However it is the responsibility of each teacher to ensure that his/her class does not abuse the equipment.

The factors which should be borne in mind when constructing a daily physical education programme have already been outlined in Chapter 2. However, research in other countries has highlighted that there is a need for lessons which have an effect on the child's circulo-respiratory functioning. It has been found that most physical education programmes neglect appropriate regular and vigorous activity (Chapter 10). In Canada (2.9) and Australia (2.10) many of the programmes have recommended a fitness lesson and a separate skills lesson each day. The results from the Linwood Project (chapter 5) indicated that if the class teachers and specialists were fully aware of the need for flexibility and circulo-respiratory endurance, and included these aspects within each lesson, it was not necessary to have two sessions of physical education each day. In addition to the daily fitness components within each lesson, a new concept in physical education, active health, has been included in the programme. Active health was considered by most teachers and children to be the most popular activity in the Linwood Project. The emphasis in each lesson was on encouraging children to develop a liking for, and a habit of participating in, physical activity through the motor fitness components of circulo-respiratory endurance, muscular endurance, strength, speed, agility and flexibility. The components were disguised in games which the children enjoy playing.

The research into the daily physical education programme highlighted the lack of normative data in the physical domain, at the pre-adolescent stages, in Great Britain (9.2). There is a need for anthropometric and physical fitness data. The CAHPER Fitness-Performance II test battery was used in the Linwood Project because there was no suitable test battery in this country. However in 1983 the Eurofit Experimental Battery (Council of Europe, 1983) was constructed with the intention of eventually producing a definitive test battery (in print) which could be used across Europe. Although in the experimental stages, many of the tests in this battery are identical to those used in the CAHPER Fitness-Performance II battery. The additions include the PWC170 test (physical work capacity at a heart rate of 170 beats per minute) which is considered a better method of estimating aerobic power than distance runs. The standardisation of tests is highly desirable and recommended for future research or collection of normative data.

There are several areas worthy of research, similar to the Linwood Project, which would have merit and could provide necessary information. It would be vauable to monitor longitudinally in the psychomotor, academic and affective domains children who experience daily physical education throughout primary school and into secondary school. Some very important questions require further investigation. Has the Linwood Project had long term effects on the daily physical education children, although they transferred to 'normal' secondary school physical education programmes? Are there differences between children who have experienced daily physical education: at primary school and secondary school; at primary but not secondary; at secondary but not primary? Does daily physical education influence the pupil's lifestyle outwith school hours? Does physical education influence the pupil's lifestyle at the completion of their formal education? Does daily physical education influence the attitude and behaviour of children towards alcohol, tobacco and drugs?

If future research includes the measurement of academic performance it is recommended that the subjects are grouped according to age, sex and socio-economic background. In the Linwood Project the study examined the effects of the programme on groups of children (Chapter 3). It was not intended to look at individuals or sub-groups. It would be valuable to investigate the influence of the daily physical education programme on children with different academic backgrounds and with differing personality traits. Furthermore, with the lack of anthropometric and physical fitness information on pre-adolescent children, it would be valuable to create normative data on Scottish and British children.

11.3 The School Community.

The daily physical education programme in the Linwood Project involved the entire school community. Consequently the community were informed of the aims, purposes, organisation and requirements of the programme. The success of the Linwood Project was due to the co-operation, support and enthusiasm of the school community. Each group had overlapping responsibilities and demands made upon them.

11.3.1 Head Teachers.

The primary head teacher is a key figure in the planning and implementation of a daily physical education programme. She/he has the overall responsibility for the organisation of the programme in her school. Before the commencement of the programme it is essential that the head teacher oversees the planning of facilities and timetabling of classes to physical education. The enthusiasm and support of the head teacher will assist the class teachers and specialists in the implementation of the programme and also satisfy the parents that their children are engaged in a worthwhile development. She can help overcome the initial fears, which many class teachers new to the programme experience, by being sensitive to curriculum adjustments and giving the necessary support. She should also encourage the class teachers to become involved in the programme and to participate in the physical activities with their classes. The head teacher should be a central figure in the evaluation of the physical education programme within her school and should liaise with the co-ordinator of the programme and the advisers in physical and primary education to ensure that her school is in step with developments in the wider community.

11.3.2 Class Teachers.

It has been customary in many schools for the specialist to assume responsibility for the lesson while the class teacher simply passed over the class and played no role in the programme. The class teachers must be involved in the teaching of the programme. It is essential that she fully understands the objectives of the programme and gives a professional commitment to it. She should provide good leadership and be an example and model for the children to follow (9.1.2). She should encourage them to be appropriately attired for each lesson. Her teaching role should progress from being an observer to being a co-operative partner with the specialist.

Eventually she should be responsible for all, or particular aspects, of her class' programme with the specialist available for consultation (Chapter 10). The class teacher will never be expected to know all the answers and should be encouraged to have pre- and post-lesson discussions with the specialist. There should be opportunities for the class teacher to attend in-service courses designed to suit the needs of those engaged in planning and teaching daily physical education. She must regard daily physical education as an integral part of the curriculum and not as an extra which the children enjoy but has little relation to other aspects of class work. It is valuable to include classroom-related work as part of the discussion with the specialist. This keeps him in touch with other areas of the curriculum and allows opportunities to integrate physical education into the wider curriculum (Chapter 10).

11.3.3 Specialist Teachers.

The specialist teachers should consider that the secondary school is the focal point of the community, and consider that their responsibility is the physical education of children, from 5 to 16+ years, in that community (9.1.3). Their role in the primary school is to develop the primary teacher's expertise in a broad and balanced physical education programme (Chapter 10). It is essential that the specialist is aware of the ethos of the primary school. He should be knowledgable about, and sensitive to, the physical, psychomotor, social and emotional development of primary school children. This should be reflected in the planning and implementation of the programme.

The specialist should also be aware of the problems which the class teacher may have in teaching physical education and should always work at her pace (Chapter 10). He should involve the class teacher in the planning and evaluation of the programme. The specialist should attempt to become familiar with the class work in other curricular areas which may help in making the children's experiences more relevant and coherent (Chapter 10).

11.3.4 The Co-ordinator.

The co-ordinator is the link between the primary schools, secondary school(s) and the other agencies involved in daily physical education across a division. He could be a member of the secondary school physical education department with special responsibility for daily physical education or he may be the equivalent of a staff tutor with responsibility for several daily physical education communities. He should assist the head teacher in timetabling and ensure that there is a satisfactory supply of equipment in each school to meet the programme requirements. His duties include supporting and encouraging those involved in the programme in the form of workshops, induction of new staff, introducing new developments and assisting with programme interpretation. The co-ordinator should also be an important link in the arrangements of festivals and joint school ventures.

There should be several meetings each academic session beween the co-ordinator, class teachers and specialists. The meetings should include planning, discussion, and the airing of problems. The dissemination of information to the schools, parents and other agencies would be part of the co-ordinator's remit.

11.3.5 Parents.

It is the duty of those involved in initiating a daily physical education programme to fully inform the parents and parental organisations about the objectives of the programme and what these imply to the education and well-being of their children. It would be understandable if some parents expressed concern about the effect which an increased allocation of time to physical education would have on the other aspects of their child's development. Without parental support it could be argued that the programme should not proceed. Consequently it is important that they are given assurances that the additional time to physical education will not disadvantage their children's learning in other areas of the curriculum. The school should encourage the parents to be familiar with the work the children are doing in the programme by arranging demonstrations, displays and encouraging the parents to 'participate' in school activities. Family involvement in physical activity would further influence the child's lifestyle (Chapter 10) and could reinforce the school's message throughout the community. This could be incorporated into aspects of the programme. Parents should be encouraged to keep the school informed of areas of concern, interest or of reactions by their children to the programme (9.1.4). Reports to parents should include the progress which their child is making in physical education and ways in which the parent can support or encourage the child outwith school time. The parents should ensure that their children are suitably clothed for all aspects of the programme.

The daily physical education programme requires the co-operation and co-ordination of a number of people within a school community. Without their full support and enthusiasm for the programme the children are unlikely to gain the benefits which have been found in the Linwood Project and in studies into daily physical education from other parts of the world.

11.4 Teacher Training.

11.4.1 Pre-service.

The findings from research indicate that the present pre-service provision, for primary class teachers, is inappropriate and inadequate (Wilson, 1975; Groves, 1977; C.O.P.E., 1979; Carre, 1980; Coonan, 1980a; Downey, 1982). Primary teachers accept that colleges of education do not prepare them adequately to teach physical education. Many feel resentment for what they consider were inappropriate courses which highlighted their inadequacy and left negative feelings towards teaching physical education.

Those responsible for curriculum development and timetable provision in the colleges of education should ensure that modern thinking on physical education at home and abroad (Chapter 2) is reflected in the present and future training of primary class teachers. It is important that the colleges of education give physical education a more prominent position in the eyes of the pre-service teacher.

Courses for pre-service teachers should reinforce the objectives of physical education which include functional development as well as the acquisition of skills. In addition, the new teacher should enter the profession enthusiastic, and with positive attitudes, towards teaching physical education.

The training of the specialist teacher of physical education should include an in-depth study of the primary child which incorporates teaching experience in the primary school. The encounter with the primary school should not be restricted to the initial year of training but should also take place when the student has become more experienced. The student should be expected to teach with the class teacher both in the physical education setting and in the classroom. This would not only prepare her/him to teach physical education in the primary school but would also make her/him aware of, and sensitive to, the ethos of this sector.

11.4.2 In-service.

It is important that class teachers are encouraged to attend in-service courses in physical education. Since the inadequacy of pre-service training has been longstanding, most primary teachers need assistance in the theory and practice of physical education.

There is also a need for in-service training for physical education specialists. In the past they have been criticised for watering down secondary school programmes for the primary school. With the increasing presence of specialist teachers of physical education in the primary school, it is necessary that they are exposed to the psychological and physiological requirements of the pre-adolescent and to teaching approaches suitable for the primary school.

Green and Farrally (1986) found that specialists lacked knowledge in the health-related physical fitness area. Specialists and class teachers should be made aware of the objectives of physical education in the primary school and the benefits of physical education to the total growth and development of the child, not solely his motor skill development. They should be updated on the planning, implementation and evaluation required of physical education programmes appropriate to the primary school.

11.5 Recommendations.

Based on the findings of the Linwood Project the following recommendations are made:

11.5.1 Implementing the Programme.

i) All children in primary schools should experience quality physical education each day (30 minutes per day at primaries 1-3, 40 minutes per day at primaries 4-7).

ii) The programmes should encompass breadth, balance, relevance to maturational development, differentiation, coherence and continuity.

iii) All parties need to be fully informed about the aims of the programmes.

iv) There should be an emphasis within the programmes on sequential motor development and on lessons which have an effect on the child's circulo-respiratory functioning.

v) The years from 10-14 should be considered the first priority in the development of daily physical education.

vi) Opportunities which integrate the daily physical education programmes with the work of the classroom should be maximised.

vii) The staff, resources, equipment, guidelines and in-service provision, necessary to ensure the implementation of quality daily physical education programmes should be provided.

viii) Where possible the programmes should be co-ordinated by the secondary school with its associated primary schools.

ix) A co-ordinator should be appointed to link the primary schools, secondary school(s) and the other agencies involved in daily physical education.

x) The primary head teacher should be a key figure in the planning and implementation of the daily physical education programmes in his/her school.

11.5.2 The Role of the Specialist.

i) The specialist teacher should be aware of, and sensitive to, the ethos of the primary school.

ii) The specialist teacher should regard the physical education of children, from 5 to 16+ years, as his/her responsibility.

iii) The specialist teacher's role in the primary school should be to develop the primary teacher's expertise in a broad and balanced physical education programme.

11.5.3 The Role of the Class Teacher.

i) The class teacher should regard daily physical education as an integral part of the curriculum.

11.5.4 The Client Groups.

i) Children should be encouraged to take responsibility for aspects of their own physical education.

ii) Parental interest and involvement in their child's physical activity should be encouraged.

iii) Where possible the activities should be co-ordinated to link primary and secondary schools to community programmes.

iv) The emphasis placed on the positive social and emotional development of the child in school should be continued in the community setting.

v) Competition within and outwith school should be used positively to encourage effective interrelationships between children.

11.5.5 Evaluation.

i) Illuminative evaluation should be used to interpret the interaction of the curriculum and the learning milieu.

11.5.6 Major Recommendations.

Based on developments in other countries and on the specific recommendations previously listed from the findings of the Linwood Project, six major recommendations are made:

I All children should receive quality daily physical education programmes throughout primary school.

II Programmes should emphasise cardio-vascular fitness, acquisition of motor skills, knowledge and understanding of physical education.

III Colleges of Education should take steps to identify the physical education requirements of teachers in the field and to apply these, and modern ideas on physical education, to the pre-service training of primary teachers.

IV Colleges of Education should recognise physical education as a unique and essential aspect of the curriculum and increase the allocation of time to it in pre-service training.

V Regional authorities should allocate staff, resources, equipment, guidelines and in-service provision, as is necessary to ensure that daily physical education programmes are provided within their area.

VI The Scottish Education Department should endorse the concept of daily physical education nationally.

Chapter 12.

Conclusion.

To have suggested that children in this country should receive physical education every day would have been considered out of the question ten years ago. Educationists and lay men would have considered it an excess of self-indulgence at the expense of the 'real' education of young children.

Despite the fragmented approach of looking at motor, social, emotional and intellectual development, the child must be regarded as a complete individual who is influenced by the interrelationship and interaction of these developmental aspects.

> 'His daily schedule affects all phases of his growth, and in turn, the pattern and speed of his growth affect his reaction to his daily schedule. What he accomplishes in school, in play, or in any other part of his living is deeply affected by his physical health, by his mental adequacy, by his work or play, and by his emotional freedom to attend to it.'
>
> (Breckenridge and Vincent, 1955)

APPENDIX A.

Personal summary of relevant selections from:

Daily Physical Education/Fitness Survey. Manitoba Department of Education (1980).

Introduction.

The survey was undertaken for the Department of Education by the Physical Education staff of the Curriculum Services Branch. The results in the report were to be used to determine recommendations for time allotments and in the implementation of the revised k-12 physical education programme.

Summary.

Questionnaires were sent to all superintendents' departments and schools in the province. There was an 'extremely' high response to the questionnaire (75% of superintendents and 69% of principals).

'In general, the Survey documents (among others):

- Significant support from all levels of administration for the implementation of a daily physical education/fitness program in the province of Manitoba.
- The majority of schools require teacher in-servicing to implement a daily physical education/fitness program.'

When asked if daily physical education/fitness was a desirable objective for their schools, 91.5% of responding school division/district superintendents believed that it was.

The survey indicated that approximately 15% of the schools in Manitoba at the elementary school level provided supplemental fitness activities in addition to their regular scheduled physical education programmes.

From the responding principals 71.8% felt that daily physical education was a desirable goal for their schools.

	'Elementary	High School	Total
Yes	300 (73%)	104 (77%)	404 - 71.8%
No	106 (27%)	31 (23%)	137 - 24.3%
Missing			22 - 3.9%
			563 - 100%'

The following reasons were given (in priority):

'Improves fitness (33%)
Desired goal for all (15%)
Positive health benefits (14%)
Daily physical education is already implemented (7%)
Improves lifestyle (5%)
Stimulates mental activity (5%)
Improves academic performance (4%)
Other (17%).'

Of the 24.3% of principals who responded in the negative to the question of daily physical education being a desirable goal, 'many stated that it would be desirable if certain barriers were overcome.'

'Reasons given for not subscribing to the concept are as follows (in priority):

Insufficient time (25%)

Inadequate facilities (15%)

Recess and noon hour activities are sufficient to provide fitness (10%)

Existing program is adequate (7.5%)

Conflict with academics (3%)

Other (27.5%).'

Appendix B.

Interview conducted by Senior Lecturer in Primary Education with Class Teacher 1. - 28.6.82.

(Edited transcript from taped interview)

Interviewer (Q). Do you feel as a class teacher that the amount of time spent on physical education has been time wasted or that it has been spent beneficially?

Class teacher (A). At first it was a novelty but as we got on I began to panic because I wasn't covering as much of the separate subjects that I would have liked to cover.

Q. Do you still feel that now?

A. No, I don't. As the year went on I had to change and decide what was important, what had to be done, what could be fitted in at other times and I did more actual teaching to children rather than them sitting working on follow up work. I did more oral work and had more contact with the children, more basic teaching.

Q. Do you feel that approach is more beneficial?

A. Yes I do. It's hard work and you have to realise that some things obviously have to go, but I think I've taught well this year. I'm happy with my teaching and happy with the results I've got from the children.

Q. Some people would say a lot would have to go if you are spending an hour of the day each week on P.E.

A. Well the first thing which I decided would have to go was the television programmes. I only went to television prgrammes which I thought would be particularly beneficial to something we were doing at the time. The other primary 6 went to roughly three television programmes per week on different subjects, but I would look through the pamphlets and decide if a programme was worth going to. If I decided it wasn't I would leave it.

Q. What strikes me is the enormous range of ability in the class. Do you manage to give the necessary individualised attention which some obviously require and do all the other things as well?

A.Whether in fact the remedial children have suffered or not I don't know, but I think socially it's been very beneficial to them. There is no stigma attached to them now. They are part of the class. Even the poorest child. There is a big difference in their confidence. Even if their work has suffered slightly I'm sure that with the confidence they have gained this year they will pull back with extra help. I have done a bit of testing on them. I tested their spelling and reading in November and February. As far as I could tell they slipped in November but in February they were on an even keel. I wouldn't say their basics have suffered.

Q. What about the rest of the children?

A. There are areas of work in which I can see a big improvement. For the past year we've gradually built up creative writing and I see a big change in it in particular, in their style, use of vocabulary and the way they set things out. A lot of the creative writing we did was connected with experiences the children had in the gym and sports centre; something they had taken part in. They were all keen to write. With past classes I have had it has always been, 'Oh, do we have to?' But this class are very keen and a few are desperate to write. I'm very pleased with the standard of their writing.

Q. Do you feel that their standard of reading has beeen maintained in the type of work they have been doing?

A. As far as I'm concerned I check their reading groups in the classroom. The remedial readers are heard every day and if we could possibly get them to a remedial teacher then they would be heard twice a day. I knew reading would probably be one of the areas I would have to concentrate on. I kept their class reading up.

Q. Taking the other main area of the curriculum - mathematics, it seems to me that from the material I've looked at there has been quite a concentration on practical measurement.

A. The maths programme we have is S.P.M.G. and it covers all areas of maths and arithmetic. However in athletics in particular we were using timing and measurement; measurement in metres which reinforced the decimals. The children were actually measuring something they had done and it meant something to them. They were using measurements in their normal language. We would do conversions as we were working through our athletics, which I found helped the measurement we were doing in the class. Although we were doing it anyway, I think athletics gave extra stimulus.

Q. Is the one hour per day coming at the same time each day or are there varying times throughout the week?

A. When we first started it was mostly mornings. I personally preferred P.E. in the afternoon because I was taking part myself in the programme. First thing in the morning, if we were doing a lot of running, I found when I came back to the class I was tired and suffering a bit.

Q. Were the children also tired coming back from P.E. first thing in the morning?

A. No. I think they were quite bright and ready to work. I felt I was letting them down. I was a lot happier when we went on to three afternoons a week - Tuesday, Wednesday and Thursday; Monday after morning interval and Friday first thing in the morning. I liked having the two mornings at both ends of the week. But everything that was done in the gym was brought back to the classroom. If there was anything that we did that was of benefit then everything else stopped. We would stop the maths and do poetry or creative writing.

Q. You have already said that you have done much more direct teaching and made less use of text books. Has your approach to teaching been altered in any other respect?

A. The only thing is how much time the children spend doing time-consuming exercises that are all the same. You know they just churn them out quickly. That has had to go this year. I think that some people would say that the time spent on P.E. was time wasted. But I think with the hour out of the day and having readjusted the day to suit, the teaching I did with less time was better than the teaching I was doing with more time.

Q. What about the other areas, like music, art and so on? Obviously from the evidence about us art has not been neglected. What about music?

A. Well I am not musical. I took another teacher's class for P.E. and she took my class for music. I did this last year and I'll do it again.

Q. Do you feel that the class' attitude has altered in any way?

A. I would say so. Nothing is a burden to them. The children are much more willing to do things. Nothing is too much of an effort. On the whole it's been a very untroubled year. There have been no fights, no problems, no teachers have had to say that they have problems with my class.

Q. Would the children be quite prepared to do the same next year?

A. There are some children who obviously find themselves in difficulty with some activities. We had one girl who was not at all good at racquet sports but worked hard at them and improved. However the same girl is an excellent runner and thoroughly enjoys it. Not everyone likes everything, even adults.

Q. What you are saying is that you've worked hard, they've worked hard, but the benefits have been worth the effort.

A. Yes, I think so, for the children and for myself. I, myself, have achieved a standard of teaching that I really was quite proud of. I thought this has brought out the best in me.

* This transcript has been included with the permission of class teacher 1 and the interviewer.

Appendix C.

Daily activity diary completed each morning throughout the school year by the 'Daily P.E.' children in the Pilot Study.

Diary

Name:.................... Date (w/b):.......

	Fri.	Mon.	Tues.	Wed.	Thur.
1. Method of travel from school: a-walk; b-run; c-cycle; d-car; e-bus; f-other.					
2. Time of arrival at home (to nearest half hour).					
3. How was time spent after school and before bed? a-sitting about; b-T.V.; c-playing; d-club; e-other.					
4. Time of going to bed (to nearest half hour).					

5. Time of rising (to nearest quarter of an hour).					
6. Method of travel to school? a-walk; b-run; c-cycle; d-car; e-bus; f-other.					

	Saturday	Sunday
7. Physical activity at weekend: What, where, when (a.m.,p.m.,evening), how long, with whom (e.g. pals, team, club, parents, brothers/sisters).		

Appendix D.

Questionnaires to parents of children engaged in the daily physical education programmes in the Pilot Study (Questionnaire 1), and in the subsequent year (Questionnaire 2). Issued in June at the conclusion of the Pilot Study and at the conclusion the subsequent year.

Note.
The questionnaires sent out to parents consisted of boxes to be ticked and with sufficient space to allow comment. With the exception of these aforementioned alterations the following questionnaires are identical to those received by the parents/guardians.

Pre-amble.

The aim of this Questionnaire is to collect your responses to the provision of Physical Education in your child's school.

The term 'Physical Education' for the purposes of this Questionnaire is defined as 'the activities which occur in your child's normal physical education class and not organised games, sports or activities which take place outside of school time.

All answers will be treated with confidentiality and no information regarding name or address is asked for.

Please return the completed questionnaire with your child as soon as possible.

Questionnaire 1.

Instructions.

In the following questions, please tick the box which you consider most accurately reflects your opinion. When comments are requested please keep them brief and within the space provided. Any additional comments may be added on a fresh sheet of paper and attached to the completed questionnaire.

1. Do you feel the daily physical education programme has been worthwhile?

Yes. O No. O Don't Know. O

Comments.

2. Has there been an improvement in your child's attendance at school this year?

Yes. O No. O Don't Know. O

Comments.

3. Is your child more healthy now than before the programme started?

Yes. O No. O Don't know. O

Comments.

4. Did your child suffer from any illness or allergy before the programme started?

Yes. O No. O

Comments.

5. Has your child's attitude changed:

a) at home? Yes. O No. O Not Sure. O

b) towards you? Yes. O No. O Not Sure. O

c) towards brothers/sisters? Yes. O No. O Not Sure. O

d) towards friends? Yes. O No. O Not Sure. O

Comments.

6. Have you noticed any change in your child's health this year?

Yes. O No. O Don't Know. O

Comments.

7. Has your child's personality changed this year?

Yes. O No. O Not Sure. O

Comments.

8. Has your child developed any new interests this year?

Yes. O No. O Not Sure. O

Comments.

9. Has your child's behaviour changed this year?

Yes. O No. O Not Sure. O

Comments

10. Has your child done better at school work this year than before?

Better. O Same. O Poorer. O

Comments.

11. How do you feel about the time spent on physical education this year?

Too much. O About Right. O Not enough. O

Comments.

12. Has your child a bigger appetite this year than last?

Yes. O No. O Not Sure. O

Comments.

13. Does your child eat different food since the programme started?

Yes. O No. O Not Sure. O

Comments.

14. Has your child gone to bed earlier this year?

Yes. O No. O Not Sure. O

Comments.

15. Has your child slept better this year?

Yes. O No. O Not Sure. O

Comments.

16. Has your child made new friends this year?

Yes. O No. O Not Sure. O

Comments.

17. Were you concerned about your child's school performance this year?

Yes. O No. O Not Sure. O

Comments.

18. How do you think your child's performance in school has gone?

Very Well. O Well. O Average. O Below Average. O Poorly. O

Comments.

19. Do you feel the programme has changed your child?

Yes. O No. O Not Sure. O

Comments.

20. Have you any regrets about this year and the programme in which your child took part?

Yes. O No. O Not Sure. O

Comments.

21. Has the programme had any effect on you?

Yes. O No. O Not Sure. O

Comments.

22. If you could start again would you have any reservations about the programme?

Yes. O No. O Not Sure. O

Comments.

23. What would you like to happen now regarding your child and the programme?

Comments.

Name:

(Father/Mother/Guardian)

Questionnaire 2.

Instructions.

In the following questions, please tick the box which you consider most accurately reflects your opinion. When comments are requested please keep them brief and within the space provided. Any additional comments may be added on a fresh sheet of paper and attached to the completed questionnaire.

1. a) What sex is your child? Male. ☐

Female. ☐

b) Age of child last birthday? Age. ☐

2. How important do you think Physical Education should be in a pupil's schooling?

More important than all other subjects... ☐

More important than most other subjects... ☐

Equal in importance to other subjects... ☐

Less important than most other subjects... ☐

Less important than all other subjects... ☐

Don't Know... ☐

3. Rate the importance of each of the following subjects to your child's education at PRIMARY SCHOOl.

	Importance		
	Not	Fairly	Very
Art/Craft...			
Drama....			
History/Geography/Science...			
Language Arts (English)....			
Mathematics...			
Music...			
Physical Education...			

4. Rate the importance of each of the following subjects to your child's education at SECONDARY SCHOOl.

	Importance		
	Not	Fairly	Very
Art/Craft...			
Drama....			
History/Geography/Science...			
Language Arts (English)....			
Mathematics...			
Music...			
Physical Education...			

5. How often should children in primary 6 and primary 7 have physical education classes?

Not at all... ☐

One class a week... ☐

Two classes a week... ☐

Three classes a week... ☐

Four classes a week... ☐

Five classes a week... ☐

Don't Know... ☐

6.How much should physical education classes help your child to:

	Not at all	A little	Quite a lot	A lot	Don't know
a) Learn and practise new skills.					
b) Use skills in different activities.					
c) Learn how the body works.					
d) Learn how to play games and sports.					
e) Learn ways to stay fit.					
f) Develop personal fitness.					
g) Develop a good attitude towards taking part in physical fitness.					
h) Feel good about himself/herself.					
i) Get along with others.					

7. How do you rate your child's fitness now in comparison to the start of the programme?

Less fit...	
The same...	
Fitter...	
Much fitter...	
Don't know...	

8. How do you rate your child's attitude since the physical education programme started?

	Poorer	The same (Bad)	The same (Good)	Better
a) At home..				
b) Towards you...				
c) Towards brothers / sisters...				
d) Towards friends...				
e) Towards school...				

9. How do you feel your child has done at school this year?

Poorly...	
Not at all well...	
The same...	
Quite well...	
Very well...	
Don't know...	

10. How do you feel about the time spent on physical education this year?

Too much...	
About right...	
Not enough...	

11. Has your child changed his/her way of spending time outside of school?

	Less.	The same.	More.
a) Playing sports...			
b) Television/Video...			
c) Reading...			
d) Meeting friends...			
e) Sitting about...			
f) Club activity...			

12. To what extent have you encouraged your child to become involved in physical activities?

Not at all... ☐

A little... ☐

A fair amount... ☐

A lot... ☐

13. To what extent have _you_ been encouraged _by_ your child to become involved in physical activity?

Not at all... ☐

A little... ☐

A fair amount... ☐

A lot... ☐

14. Have you any regrets about this year and the programme in which your child has taken part?

Many... ☐

Some... ☐

None... ☐

15. Has your child done better at school work this year than before?

Much better... ☐

Better... ☐

Same... ☐

Poorer... ☐

Much poorer... ☐

Don't know... ☐

16. About how many hours of television does your child watch on an <u>average school day</u>?

Usually none...	
Less than 1 hour...	
About 1 hour...	
About 2 hours...	
About 3 hours...	
About 4 hours...	
5 hours or more...	

17. In your opinion should each of the following groups of pupils have to take physical education courses?

	Yes	No
a) Boys...		
b) Girls...		
c) Primary 1,2,3...		
d) Primary 4,5...		
e) Primary 6,7...		
f) 1st,2nd year secondary...		
g) 3rd,4th year secondary...		

18. In your opinion, what emphasis should there be on competition in physical education classes?

Considerable emphasis...	
Some emphasis...	
No emphasis at all...	
Don't know...	

19. How often do <u>you</u> take part in hard physical activity such as jogging, swimming, keep fit?

Never... ☐

Less than once a month... ☐

About once a month... ☐

About once a week... ☐

About 2-4 times a week... ☐

5 or more times a week... ☐

20. What would you like to happen now regarding your child and the programme?

Continue... ☐

Stop... ☐

Don't know... ☐

State reasons for answer:

21.

Any other comments:

22. Please indicate here who completed this questionnaire?

Male parent/guardian... ☐

Female parent/guardian... ☐

Both... ☐

Appendix E.

Reports on

I - The Pilot Study (Head Teacher of School A);

II - A Case Study in the Pilot Study (School Psychologist);

III - The Linwood Project (Head Teacher of School B);

IV - Comments relating to the daily physical education project from a progress report on 'Physical Education for Primary Pupils in Renfrew Division' (Adviser in Physical Education).

I - Daily Physical Education Programme - Pilot Study (1981-1982).

Head Teacher - School A.

All members of primary 6a ('Daily P.E.' group) entered wholeheartedly into the daily physical education programme and the class teacher, by choice, participated in each day's activities either by working alongside the children or by teaching co-operatively with the specialist. However, she faced many anxious moments during the first term as she was struggling to cram all the 'normal' class activities into 4 hours instead of 5 hours.

It was necessary to evaluate where time could be saved. Text book exercises were pruned to the relevant only and all classroom practices were examined and questioned. Only those of true educational value were embarked upon. The result was that the class teacher was engaged much more in direct teaching with individuals or groups and more marking was done in the child's presence. Her day was very demanding but rewarding.

The children were engaged in good, desirable classroom practices which resulted in commendable attitudes of independence and responsibility.

A change of attitudes was the most noticeable feature during the session. Primary 6 is well known as an 'aggressive' stage in Primary Education with discipline problems commonly arising in the playground as a result of petty arguments and squabbles. This pattern of behaviour did not appear from the 'Daily P.E.' group. They had burnt out their 'mischief energy' and played constructively. All the pupils showed a sense of purpose during their free time at school and from various reports, it became evident that their lifestyle outside of school modified accordingly. Those who could afford to, used the Sports Centre more often, many took up hobbies involving sport and running became a favourite pastime. Many children ran several miles each evening and a few participated in the Glasgow and Paisley Mini-Marathons.

The P.E. programme appeared to give the children a sense of purpose, a feeling of success, greater personal esteem and a sense of maturity. One mal-adjusted pupil, who had regularly attended the psychologist for 4 years, appeared to lose all his anti-social tendencies at school and developed interests in karate and running when out of school.

If the children have not gained in academic attainment during the experiment, I am certain that their standards have not dropped below those of the control group. It is my opinion that the beneficial gains have been emotionally and socially because of their new-found self-awareness, confidence and purpose.

18 April 1983.

Permission to reproduce this report has been given by the head teacher of school A.

II - A summary of a report to the researcher by the school psychologist on an individual child in the 'Daily P.E.' class of the Pilot Study.

The child had been referred to Child Guidance in Primary 1. When reviewed in 1981 (prior to the commencement of the daily p.e. programme) he had medical problems which affected his communication skills; had reading and mathematical problems 'in spite of intelligence apparently within the normal range.' Behaviourally he also gave cause for concern. He had no friends, was attention seeking in class, had difficulty in co-operating with others and had very low self-esteem.

When reviewed early in the following session (having completed the Pilot Study year) he was enthusiastic, purposeful and much more self-assured. He enjoyed school and had become very involved in sports which he claimed he had first evinced an interest in through P.E. at school. Although his speech was still indistinct he was no longer embarrassed by this and conversed fluently.

The child is unlikely ever to be particularly successful academically and at one time there was concern for his ability to cope in an 'ordinary' school. However, he has learned to co-operate in a group, to accept defeat without total loss of confidence and to persevere and complete tasks he would not even have attempted.

'I am sure that some at least of this change of attitude must be due to the enjoyment and success he has derived from the P.E. programme. I hope it will be developed further.'

16 January 1983

Permission has been given by the psychologist for the above report to be included.

III - Daily Physical Education - The Linwood Project.

Head Teacher - School B.

The programme began in 'School B' in August 1983 with the P6 and P7 classes having a daily lesson from the secondary 'P.E.' staff. The remit of the primary staff was initially to observe and gradually to assume a teaching role. The programme stimulated a great deal of enthusiastic talk in the staffroom and at staff meetings and in January 1985 the whole school became involved in Daily P.E., the P3-P5 staff working from the Renfrew Division P.E. Guidelines and the P1-P2 staff improvising with material from various sources.

The programe has now been running for a year and a half and we feel that it has brought the following benefits to the school.

1. A significant decrease in the instances of indiscipline occurring in the school playground. Daily P.E. provides a constructive outlet for much of the tension and aggressions experienced by pupils who live in difficult home circumstances.

2. The range of activities encompassed by the programme provides breadth to our curriculum, thereby placing success within the grasp of many pupils who do not have strong academic potential. Those who do have academic potential also benefit by extending the range

of their abilities, interests and experiences. In all pupils we can see an increase in self-confidence and self-esteem.

3. The programme encourages the development of Social Skills which in present times come high on the priority list of any school. To successfully and safely take part in many activities, the children have to co-operate with each other, solve problems through discussion, work and plan as a team, encourage and support each other in difficult tasks and praise each other in successes. Through participation, they have developed mature and responsible attitudes, not only in the gym, but also in many areas of life both in school and out.

4. Our involvement has given us the opportunity to live up to the "Sport for All" slogan, since all children have maintained a high level of interest and involvement in the wide range of activities available.

5. There are very considerable health and fitness benefits resulting from physical activities. Running parallel to these activities the children do several classroom based health education topics which deal with diet, exercise, smoking etc. In essence, what we are doing is to encourage pupils to form healthy and positive attitudes; not only to the way they look after their bodies, but also to the way they live their lives.

6. The programme provides stimulation and motivation for work in other areas of the curriculum e.g. oral and written language, maths (distance, weight, timing, heart rate), Science (muscles, bones, organs), Geography (orienteering and map plans). In this way it provides relevant and meaningful contexts for a great deal of classsroom activity.

7. The programme takes approximately 5 hours of curriculum time. This means that we have had to scrutinize class timetables and amputate meaningless timefillers. The result is a much more refined and better balanced curriculum with every subject having clearly understood aims and objectives.

8. The programme has brought considerable in-school in-service advantages, both through the involvement of secondary specialists with primary teachers and also through the number of visiting college, community and student personnel who have been involved in the project.

9. Each year, the Festivals of Sport which involve all the local schools (R.C. and non denominational) playing in mixed school teams, have produced some of the most effective primary/primary liaison and primary/secondary liaison, I have ever seen.

10. Obviously, since this is an experimental programme, the academic progress of pupils is being closely monitored and although results are not yet

published, our subjective assessment is that academic standards have not deteriorated in any way. If anything the opposite is the case.

11. Parental response to the experiment has been very favourable.

I feel that this report paints a very "rosy picture" of the progress of the expriment, but I do assure you that these are genuine findings. In my opinion, disadvantages are minimal and certainly not significant enough to dull our enthusiasm for a programme which is bringing enormous benefits, to the staff and pupils of this school.

19 April 1985.

Permission to reproduce this report has been given by the head teacher of school B.

IV - Extract from 'Physical Education for Primary Pupils in Renfrew Division'.
Adviser in Physical Education.

The Pilot Study was set up by the researcher to look into the effect of a daily lesson of physical education on primary pupils. The results of this research, though not yet complete, have in my opinion fully justified my personal belief in the value of daily activity and the effect it can have on the ambience of a school and the pupils contained therein. Discussions with parents, teachers and pupils and my own observations strengthen that conviction. A similar attitude to my own is apparent from the various education officers who have been involved in monitoring the research.

The anticipation of beneficial results from the research is highlighted by the fact that the education officers accepted without qualification the amalgamation of the Integrated Primary/Secondary programme and the Pilot Study into the larger Linwood Project which is looking at marrying both areas of research together. Three additional staff were made available for this programme.

The research has been and is a very exciting and dramatic development of physical education. If the anticipated outcome of the research is proven correct, then the development of daily physical education in the primaries is inevitable followed by research in the secondary schools along similar lines.

26 June 1985

Permission to reproduce this report has been given by the adviser in physical education.

Appendix F.

I. Mean scores - Cahper Fitness-Performance II tests - Pilot Study and Models 1, 2 and 3.

	Boys				Girls			
	Daily PE		Normal PE		Daily PE		Normal PE	
	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-
<u>Shuttle Run</u>								
Pilot Study	2.92	2.89	2.91	2.87	2.78	2.81	2.80	2.85
Model 1	2.92	3.11	3.03	2.95	2.86	3.14	2.98	2.92
Model 2	3.04	3.29	3.12	3.03	2.96	3.21	3.01	2.99
Model 3	3.00	3.10			2.90	3.11		
<u>S.Long Jump</u>								
Pilot Study	1.46	1.45	1.47	1.46	1.37	1.47	1.38	1.40
Model 1	1.42	1.49	1.43	1.44	1.35	1.48	1.35	1.39
Model 2	1.47	1.56	1.50	1.49	1.39	1.49	1.34	1.45
Model 3	1.50	1.57			1.47	1.55		
<u>Sit ups</u>								
Pilot Study	33.5	39.9	34.5	36.4	26.8	38.6	26.1	32.2
Model 1	29.9	35.1	29.6	33.5	23.6	32.4	22.8	30.6
Model 2	30.5	36.9	29.0	32.2	24.5	31.6	24.0	29.7
Model 3	41.2	39.5			37.3	40.4		
<u>F. Arm Hang</u>								
Pilot Study	29.6	35.1	30.6	27.2	21.1	28.7	18.4	17.3
Model 1	30.4	35.6	32.1	35.7	17.5	27.6	17.7	20.2
Model 2	31.8	43.0	33.3	36.0	17.8	25.5	19.0	23.6
Model 3	37.5	48.9			30.0	37.0		
<u>50 M. Run</u>								
Pilot Study	5.18	5.69	5.35	5.70	4.93	5.46	5.15	5.74
Model 1	5.28	5.61	5.37	5.39	5.06	5.40	5.24	5.27
Model 2	5.33	5.68	5.55	5.38	5.16	5.58	5.42	5.23
Model 3	5.57	5.89			5.34	5.73		
<u>End. Run</u>								
Pilot Study	2.87	3.17	2.75	3.01	2.46	2.81	2.40	2.59
Model 1	3.02	3.35	3.13	3.37	2.64	2.94	2.73	2.92
Model 2	3.37	3.66	3.27	3.26	2.90	3.18	2.93	2.98
Model 3	3.22	3.40			2.79	2.97		

Scale Descriptions.

Scale A - Attitude to School.

B - Interest in School Work.

C - Importance of Doing Well.

D - Attitude to Class.

E - 'Other' Image of Class.

F - Conforming v. Non-Conforming Pupil.

G - Relationship with Teacher.

H - Anxiety in Class.

I - Social Adjustment.

J - Academic Self-Image.

	Boys				Girls			
	Daily PE		Normal PE		Daily PE		Normal PE	
Scale	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-
F								
Model 1	2.70	2.92	2.42	2.73	3.02	2.98	2.66	2.81
Model 2	2.71	2.69	2.82	2.05	3.01	2.66	2.65	2.52
Model 3	3.03	2.59			3.09	2.60		
G								
Model 1	2.13	2.24	1.24	1.61	2.83	3.03	1.78	2.09
Model 2	2.27	2.21	2.00	2.09	3.31	3.11	2.88	2.84
Model 3	1.97	2.06			3.44	3.10		
H								
Model 1	2.76	2.93	3.00	2.86	2.22	2.63	2.00	2.50
Model 2	2.74	2.96	2.37	3.27	2.91	2.59	2.59	2.96
Model 3	3.28	3.53			3.39	2.80		
I								
Model 1	2.87	3.13	2.97	3.21	2.37	2.67	2.19	2.50
Model 2	3.32	3.40	3.22	3.41	2.73	2.91	3.00	3.16
Model 3	3.53	3.22			3.00	3.20		
J								
Model 1	10.1	10.1	8.6	9.3	9.4	10.1	8.6	9.0
Model 2	10.0	10.1	9.7	10.4	10.1	10.3	8.5	10.1
Model 3	10.6	10.4			10.8	10.6		

II. Mean scores - 'Attitude to School - S7' Questionnaire

- Models 1, 2 and 3.

	Boys				Girls			
	Daily PE		Normal PE		Daily PE		Normal PE	
Scale	Pre-	Post-	Pre-	Post-	Pre-	Post-	Pre-	Post-
A								
Model 1	2.86	3.26	2.61	3.11	3.72	3.86	3.53	3.84
Model 2	3.15	3.18	3.37	2.73	3.97	4.11	3.71	3.04
Model 3	3.97	2.75			4.52	3.10		
B								
Model 1	2.67	2.98	2.29	3.00	3.17	3.38	2.88	3.75
Model 2	2.88	2.69	2.85	2.14	3.65	3.41	2.94	2.76
Model 3	3.19	2.41			3.61	3.05		
C								
Model 1	7.30	7.05	6.26	7.22	7.42	7.57	7.47	7.59
Model 2	7.61	7.05	7.52	6.78	7.76	7.98	7.06	7.28
Model 3	7.81	6.19			8.00	7.00		
D								
Model 1	10.8	11.5	10.0	9.8	11.7	12.5	10.4	12.2
Model 2	11.5	11.2	10.9	10.1	12.7	12.6	12.5	12.1
Model 3	12.8	10.5			13.2	13.3		
E								
Model 1	2.82	2.99	2.40	2.49	3.06	3.18	2.72	3.00
Model 2	2.82	2.84	3.22	2.91	3.17	3.13	3.24	3.52
Model 3	3.06	2.94			2.78	2.80		

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