Chapter 6

THREE CASE PROFILES

Different frameworks for analyses can be generated from the case study. It offers an opportunity to use inductive reasoning in uniting theory and practice.
(Raim & Adams 1982, p.116)

Although such a simple descriptive account is often both unsystematic and uncontrolled, it has played some important roles in the scientific study of behavior (Neale & Liebert 1973, p. 144)

Introduction to Chapter

The scope of the previous three chapters, in reporting group trends, could not allow an in-depth analysis of the individual. Given the multi-dimensional nature of the clumsy child, value can be gained from examining individual cases. Through case studies, this chapter expands the holistic view of clumsiness to accommodate the heterogeneity of the problems associated with the condition. This is achieved by reporting information gleaned from Chapter 3 about each subject, with the addition of information on the selected children not reported previously. Given the diverse set of possible causes and outcomes associated with clumsiness, it is only when individual information is available, analysed and interpreted diagnostically, that individuals can be assisted with their difficulties.

Through this process the chapter addresses the fourth of the original research questions, which follows the identification and the description of the groupings of features associated with clumsiness. The question asks:

(D) How do these features manifest themselves and affect the individual child with motor difficulties?

As indicated by the initial quote (Raim & Adams 1982), the case study provides the opportunity to explain theoretical concepts through real examples. This chapter links the previously explored theories and findings, by presenting exemplars which illustrate various facets of clumsiness, either typifying or describing the diversity of the condition. In an attempt to overcome some of the disadvantages in case study analysis, pointed to by Neale and Liebert (1973) in the second quote (above), this chapter applies a systematic procedure in reporting each case, following the examples of Besag, Fowler, Watson, Bostock and Wilkins (1991) and Stewart (1990). This is achieved by providing a uniformity of format for the information given on each child through the broad spectrum of sources. The organisation

of the material presented, not only furnishes the opportunity to compare and contrast within the cases but links also with trends established in Chapters 3, 4 and 5.

It was decided to select three children[6.1] for the case studies, this being a manageable number within the scope of the thesis. They were selected from a group of five children whose parents were willing to provide a more comprehensive and personal follow-up interview, in addition to the initial interviews, which were reported in Chapter 3. These five children, comprising two girls and three boys, were video-taped for further skill analysis, to be used subsequently in the case study. The video-taping of one girl was technically deficient, rendering her unsuitable for selection, as the case study report would be deficient in this area. In order to maintain some gender balance, the remaining girl was selected as one of the subjects. It was then decided to randomly select two boys from the three meeting the set criteria. However, selection of the boys was determined in any case as one of the boys, together with his family, moved from the district before the second interview was arranged. Therefore, the selection of the children was made on both a practical and pragmatic basis, as events transpired. The additional information provided for the case studies arises from the second parent interview, the video analysis and more detailed reporting of the program instructors comments.

The children selected for the first and third case profiles are taken from the group of children who formed the largest cluster at the point deemed appropriate for identifying the groups of subjects in the previous chapter. The second case profile describes a subject who remained independent until the final step in the clustering process. This provides a contrast in the cases selected as they represent the extremes of the groupings produced by the analysis from Chapter 5.

6.1 The policy for anonymity in naming the children is maintained in this chapter.

CASE ONE : ANN

Ann was seven years of age when she was referred to the UNE Gymstart program by her teacher. She is the second born of three children, with a brother two years older and a sister three years younger than herself. Both of Ann's parents live at home, her father being educated to Year 8 level and her mother holding TAFE qualifications. Neither parent regarded themselves as clumsy as a child but her brother shows similar movement traits to Ann, although this has not been confirmed objectively.

Ann was born after 39 weeks of pregnancy. The placenta had broken away and Ann was born due to starvation of the placenta. Ann had jaundice when she was born and her parents described her as 'long, wasting and scrawny'. It was found subsequently that she had inherited the blood disorder spherocytosis from her father. At the age of five, Ann had her spleen and gall bladder removed due to this blood disorder. Spherocytosis is characterised by anaemia (Agre, Casella, Zinkham, McMillan & Bennett 1985), which reduces the oxygen carrying capacity of the blood (Wilson 1990). Ann takes a daily dose of penicillin and antibiotics for problems associated with the spherocytosis. She had been anaemic before the surgery and somewhat listless. However, her parents reported that this had little impact on her access to physical activity and she exhibited normal patterns of play.

Ann walked at twelve months and talked at an earlier age than most children. She appears to have positive relationships with friends and siblings. Fine motor coordination problems are manifested both at home and at school. Ann prefers her fingers to cutlery at meal times and while her parents have not made a major issue of this, they have expressed their concern. Ann's lack of ability to write effectively is a serious problem and she holds the pen or pencil with an unusual grip. Ann is slow in dressing herself, although her mother has attributed this to a sleepy attitude in the mornings. Buttons were mentioned as particularly difficult for her.

Apart from problems related to Ann's blood disorder and her referral to UNE, she had not been referred to any other professionals in connection with any health, development or movement difficulties. Since participating in the Gymstart program, her parents reported a consistent improvement in Ann's movement skills and in her level of self confidence. She exhibits a normal pattern of interests in physical activity, changing her focus from activity to activity for reasons not unusual at her age.

PHYSICAL CAPACITIES

An idea of Ann's anatomical structure can be gained through analysis of Figure 6.1. She is a very tall girl (approximately 2.5 standard deviations above the mean for her age group) and aesthetically, her appearance gives the impression of normal height to weight proportions.

However, she is a heavy girl with a level of body fat at 23 per cent of total body weight. Ann is overweight yet has a normal appearance, i.e., there is a lack of the rotundity often associated with higher levels of body fat.

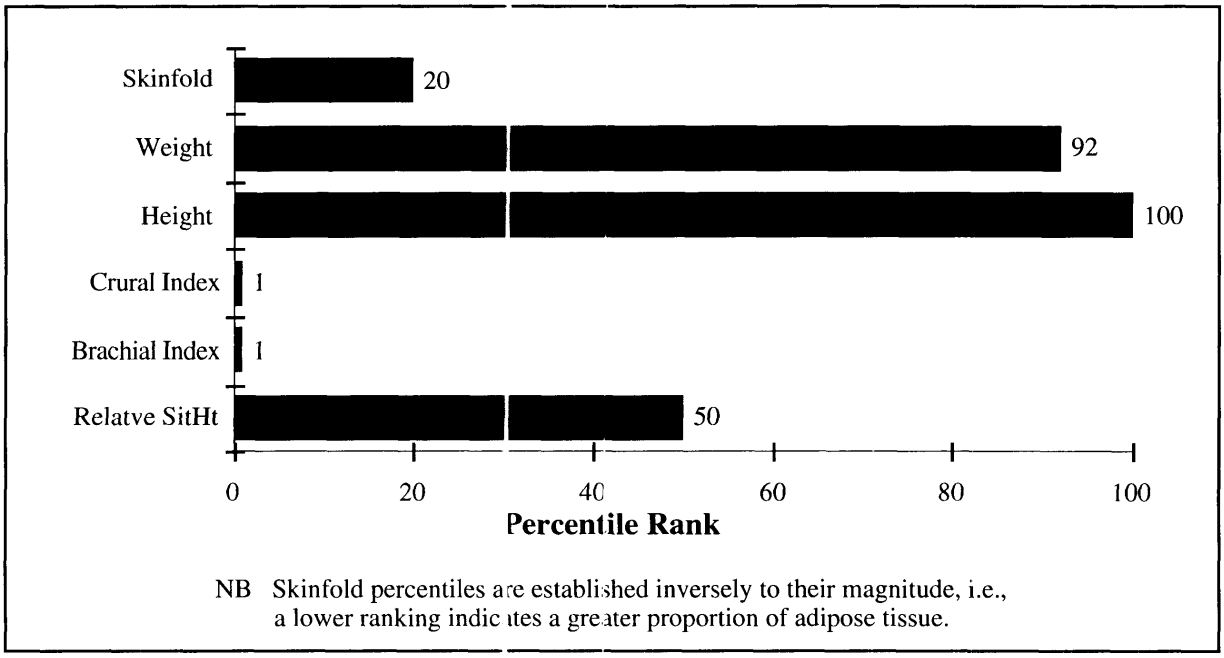

Figure 6.1 : Anthropometric Profile for Ann

At seven years of age, she is unlikely to have developed to even the early stages of puberty, therefore the higher levels of body fat cannot be attributed to increases associated with sexual development (Hills 1991b). Given these factors, Ann's height, weight and body fat measures may indicate a lack of underlying musculature, which could explain her normal appearance proportionately, whilst being overweight. Much of her girth is composed of minimal muscle tissue, an elevated adipose tissue level, viscera and bone, rather than normal muscle tissue, normal adipose tissue, viscera and bone. Her excess body fat is likely to affect her performance both biomechanically, as a disadvantage in movement, and physiologically, detracting from efficiency in providing energy to the muscles.

Analysis of Figure 6.1, reveals an average percentile ranking for Ann's Relative Sitting Height and very low rankings for her Crural Index and Brachial Index. The raw data for these indicators show a Relative Sitting Height of 53, placing her within a normal range. However, the two indices of limb proportions, point to a marked mechanical disadvantage for Ann in some movements. Her low Crural Index reading of 74, denotes a longer thigh to calf proportion and her very low Brachial Index indicates an upper arm segment length almost twice that of the forearm. This disproportion in limb segment lengths coupled with excess body fat would render Ann to be a mechanically inefficient mover, even if all other parameters were normal.

FITNESS LEVEL

Ann's profile of her percentile rankings for fitness parameters is presented in Figure 6.2, which indicates generally low fitness. Her inability to work continuously at the whole body level is demonstrated in her low ranking on the stamina test (800 metre run). This would be a direct consequence of the spherocytosis, which affects adversely her oxygen uptake capacity (Strauss 1979). At a local level, Ann's endurance capacity is also low, as indicated by her abdominal strength ranking (from a 60-second sit-up test).

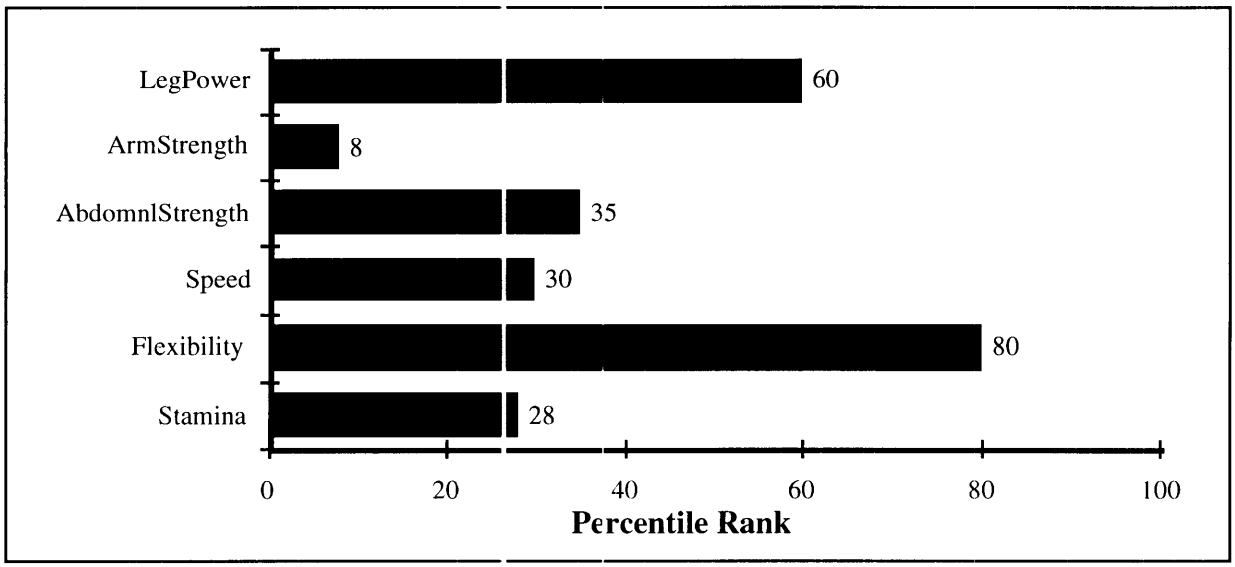

Figure 6.2 : Fitness Profile for Ann

The likelihood of diminished musculature and inefficient limb proportions, suggested previously, is endorsed by her low rankings on speed (50 metre sprint test), her poor abdominal strength and very low arm strength (flexed arm hang test) rank. There are exceptions to this trend in both flexibility and, surprisingly, in leg power (vertical jump). However, the high flexibility (sit and reach test) rating can be attributed also to a lack of musculature, as mentioned in Chapter 3, with Ann typifying the group trend in this phenomenon.

All components of physical fitness have an affect on the ability to participate proficiently in physical activities. Some aspects of fitness may limit the ability to control and execute a task. Ann would have severe limitations on tasks involving her upper body and serious limitations in endurance activities. In general, her fitness level is poor and certainly would detract from efficient physical performance.

MOTOR SKILLS

The evaluation of Ann's motor skills took place in three forms, namely the McCarron Assessment of Neuromuscular Dysfunction (MAND), continual subjective assessment by

Ann's program instructors (documented in their final reports), and video recordings of Ann. The latter took place during two of the program sessions, where targeted skills were recorded.

The MAND Test

The MAND scores for Ann, indicate a motor impairment level of major concern. Her profile of the neuromuscular development index (NDI) or motor quotient and the specific factor scores can be seen in Figure 6.3. Ann is considered moderately disabled on her overall neuromuscular development, as indicated by the NDI, likewise with the kinesthetic integration (KI) and bimanual dexterity (BD) factor scores. She is considered mildly disabled on muscle power (MP) and ranks at the bottom of the normal range for persistent control (PC) factor scores.

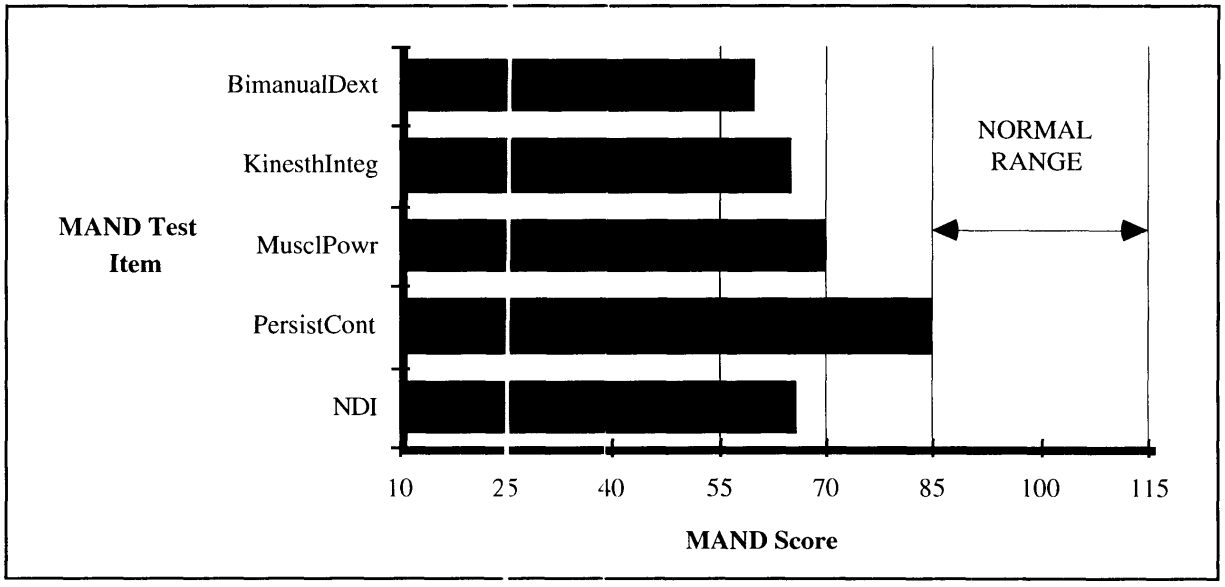

Figure 6.3 : MAND Test Factors Profile for Ann

A profile of Ann's performance on individual items of the MAND test is provided in Figure 6.4. She has a relatively inconsistent profile with severe disabilities on the hand strength and finger tapping tasks, moderate disabilities on the nut and bolt and standing-on-one-foot tasks, mild disabilities on the heel-to-toe walking and finger-to-nose tasks, and recordings on the remaining four tasks fall within the normal range.

Ann demonstrated inconsistency between fine motor tasks and the gross motor tasks (see Figure 6.4). Her scores were considerably better in the fine motor area, with an aggregate of 35, than in the gross motor area, aggregating 21.

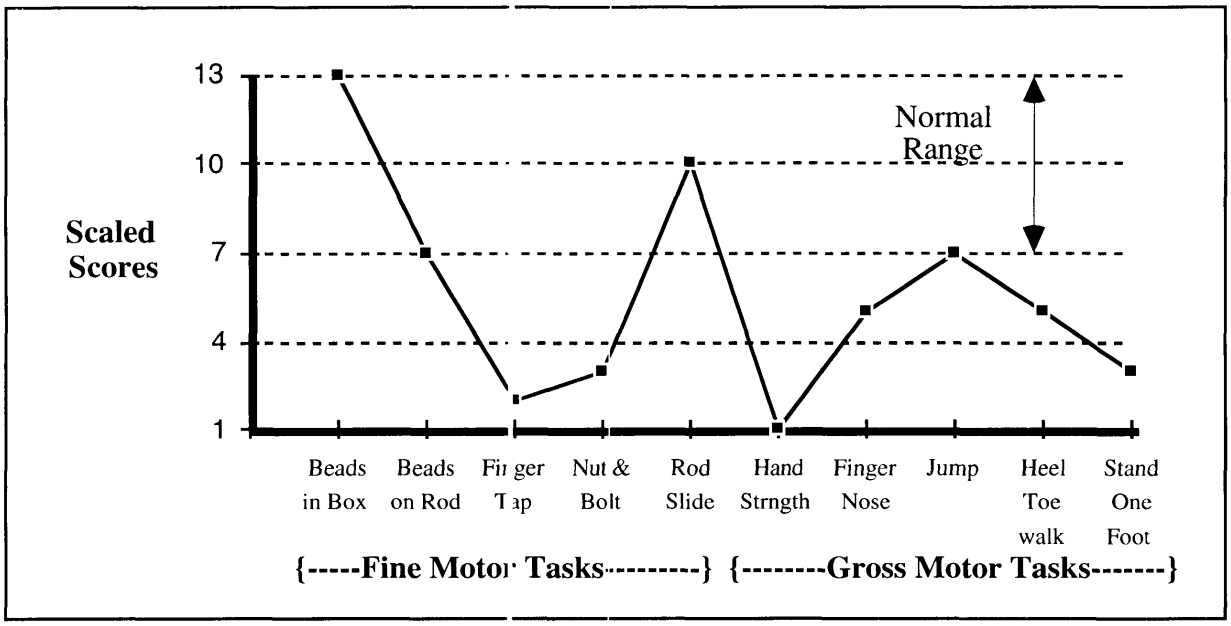

Figure 6.4 : Individual Profile of Neuromuscular Development for Ann on the MAND Test

Video and Instructor Observations

The instructors' observations of Ann throughout the program resulted in extensive comment on her movement skills, in their final reports. In addition, specific aspects of Ann's skills were analysed through the use of video recordings, taken at two Gymstart sessions. The following observations were made in amalgamating the transposition of the video material, through both the camera operator's report and analysis by the research director, with instructor comment.

Ann's static balance ability needs more work, as she has trouble holding a single leg balance with her eyes closed. Her ability to balance is effective when stationary with two feet on the ground, with control of centre of gravity and consequent stability is good. However, when Ann stands on her left foot, she has some difficulties maintaining balance for even short periods of time. Ann is wobbly after recovering from one foot to two. In attempting to rectify overbalancing, she tended to overcorrect and start to fall the other way. Balance on Ann's right foot was more stable. By making adjustments at the hip, knee and ankle she was able to maintain a static balance for a longer period of time than on her left foot.

Ann was confident and competent in most of the planned dynamic balance activities. Usually, she required little assistance in that her balance and mobility was acceptable, unless performing under the pressure of a set task. For example, she had difficulty performing double foot jumps over each side of a balance beam. When Ann experienced difficulty balancing, often it was due to poor posture or neglect to focus on a point ahead. When

jumping from a stationary position, Ann's technique, as she attempted to balance on landing, was reasonably good, giving at the hips, knees and ankles. However, her arm movements were not coordinated with the jump, somewhat negating the effect of the legs. These extraneous arm movements caused difficulty in her holding balance upon landing, evidenced by finishing with a small shuffle forward.

Ann has an awkward gait which can be attributed to her physical structure, especially her long limbs and lack of coordination. She had considerable deficits in this area. Particular problems included flat-footedness and loose, uncontrolled head and arm movements whilst running. Repeated direct instruction has seen only slight improvement, with attempts to run more on her toes, although often she reverted back to flat-footedness. She has gained greater control over her head movements during the program but still has trouble controlling extraneous arm movements when running. Ann is capable of coordinating the arm/leg opposition pattern when walking but tended to hold her arms close to her body or loosely at her sides when running, giving no assistance to the leg action.

In attempting to jump, Ann experienced difficulty taking off and landing with two feet together. She progressed steadily but found it difficult to maintain balance on landing, as she often had an exaggerated body position (e.g., leaning too far forward) and poor posture. Initially, Ann failed to show any substantial signs of improvement. However, after perseverance, her jumping action became more synchronised and improvement ensued. As Ann's technique improved she participated in activities involving jumping from a stationary/mobile position, jumping over objects of differing lengths and heights, to jumping over moving and stationary objects.

Static balance, dynamic balance, walking/running technique and jumping are crucial in developing movement skills. Ann's deficiencies in this area disadvantaged her severely, in that, she has not yet formed that strong structure of rudimentary skills (Gallahue 1993) upon which the fundamentals of movement are based. This lack of proficiency in these areas, poor neuromuscular control, a tendency to use extraneous head and arm movements, high flexibility and weak musculature is typical of the 'floppy' type of clumsy child (Larkin 1994), so evident in this study group. In addition, Ann's height, weight and biomechanical disproportionality of the limbs, somewhat exaggerate these disadvantages. With this in mind the remaining assessment of skills, which rely on this sound base, can be judged.

Ann could hop quite well in a straight line, backwards and sideways. While initially she also tended to use extraneous arm movements when hopping, this was remedied and her technique improved. Ann had difficulty hopping to land and holding a stance without losing balance. She was able to demonstrate a correct technique for bouncing the ball while stationary and progressed on to dribbling, basketball style. After Ann proved competent at walking and

dribbling, she was able to make direction changes and alternate hand changes while dribbling. This occurred for both walking and running.

Ann did not demonstrate good technique while throwing and catching. In the throw she did not focus on the target and was inaccurate. She had trouble focusing her eyes on the returning ball after it had rebounded off a wall. Ann found it difficult to change her focus from the target (wall) when she threw the ball, to the returning ball once it had rebounded. After practice, she still experienced difficulty but showed some improvement, with substantial improvement in focusing on the target. While catching, Ann's body position was good and her legs set apart to maximise balance. The position of her hands were wide open with fingers apart so as to create a large catching area. Once caught the arms were drawn into the body. A few misses occurred during the video session, due to a lack of attending to the ball and poor head positioning. When throwing, Ann used two hands with an underarm pass technique for a larger ball. In throwing overarm with a small ball, her elbow was too far forward, resulting in a lack of power. There was a tendency for the leg on the throwing side to go forward at the same time as the throw, rather than in opposition. However, after instruction, Ann did demonstrate a correct transfer of weight and follow through in the direction of the target.

In throwing bean bags and balls into the air, Ann found she experienced more success catching the objects if she focused her eyes on the direction of the target (as the falling object fell more accurately within the range of Ann's position). When catching from above, she experienced success if she extended her arms and opened her fingers in order to grasp the ball when it arrived, as she did for catching straight on. By encouraging Ann to take the ball to her chest when she received the ball, it reduced the chance of dropping the ball on impact. Ann learnt that in order to catch a ball that was not in her direct path line, she had to move her body in front of the travelling ball. Although Ann was developing correct catching and throwing technique, further instruction and practice are required to reinforce these. Nevertheless, her catching and throwing technique did seem to improve with practice and instruction.

Ann found it difficult to control a ball using a paddle bat, as a result of poor technique and lack of strength. She found it difficult to watch the ball and coordinate the batting action at the same time. Other types of bats were used and her striking action improved somewhat. Ann became aware of body placement and was able to focus on the ball, developing gradually some competency. Despite this, Ann has still not developed adequate skill in hitting a ball against the wall using a paddle bat.

Initially, Ann lacked control when kicking and had little judgement of distance and direction. With practice, Ann's kicking ability improved but she requires further activity that provides the opportunity to refine these basic skills and increase precision. Ann could hold and use the

hockey stick quite competently. She was able to control the ball well when moving. Ann was successful at being able to receive and block the ball sent to her at speed or from a distance. She was quite capable of using her body to trap objects and was impressive with her ability to stop a moving ball with her foot. As trapping and tracking games progressed, Ann began to move and position herself so that she could stop the ball. Similarly, she showed some promise in using equipment, such as a hockey stick, to aid in tracking and trapping a ball.

Ann has developed an unusual pencil grip that does not allow her to control a pencil. She used a circular motion to colour in and consequently her work was untidy. When shown a linear sweeping technique for colouring, she improved but her grip was still a limitation. Ann had an unusual grip for scissors but adapted readily to a more conventional method, displaying competence and neatness in cutting skills. Ann's fine manipulation skills show promise. While Ann displays some competency in this area, it is felt that further activities are needed for these skills to progress.

Summary

Ann has mild to moderate motor disabilities, evidenced by her neuromuscular development indicators (i.e., results from the MAND test). Ann's impaired neuromuscular ability would certainly detract from efficient control during the performance of any type of skill. Not only would this level of dysfunction, if left unchecked, be detrimental to the ordinary participation in physical activity but also it would be a considerable impairment to the tasks of everyday living and any prospective employment which utilised any manipulative skills. Her fine motor coordination problems are evident both at home and at school. Ann is cross dominant and this may contribute to her difficulty in writing and in some gross motor tasks, e.g., focusing to throw at a target.

Observation of Ann's skills through instructor feedback and video analysis, revealed difficulties in static balance and satisfactory performance in dynamic balance activities. She had some difficulty with ball skills and manipulation of implements. Nonetheless, Ann has responded well to the remedial program in all aspects of skill development. High motivation and enthusiasm to learn, has elicited skill development which in some ways is in contrast to the MAND test findings. This more positive view was reported by both her parents and the program instructors, and confirmed in the video analysis.

In terms of reflecting the trends shown by the study group, documented in Chapter 3, Ann's skill profile, reported here, would embody the essence of the group's skill attributes. In fact, a profile of low scores on the MAND test, difficulties in balance and other rudimentary movement attributes, and poor ball skills, are all aspects which typify the majority of the group. In addition, her inconsistency within tests on different items would exemplify the findings reported in Chapter 4 which suggest clumsy children are very task specific in their

motor abilities. However, in light of the disadvantages that Ann encounters, it can be surmised that her persistence and personality contributes greatly to her achieving an elementary level of skill, which enables her to participate in most games and sports.

SELF-CONCEPT

Ann's results on the four scales of the Self-Description Questionnaire (SDQ 1) are presented in Figure 6.6. Analysis of the profile provides indicators to Ann's self-confidence and some facets of global self-worth. The general impression is that Ann's scores on the self-concept scales indicate she fosters a certain negativity towards herself. However, caution should be used in interpreting these percentile ranked scores, in the same way as other measured parameters have been interpreted. Only scores falling below the 25th percentile rank can be interpreted confidently as low or negative, according to the test's author (Marsh 1990). In fact, Ann's scores on her feelings about physical ability and peer relationships can be considered normal. Given this, Ann seems to have serious doubts about her general self and is questioning aspects of her physical appearance.

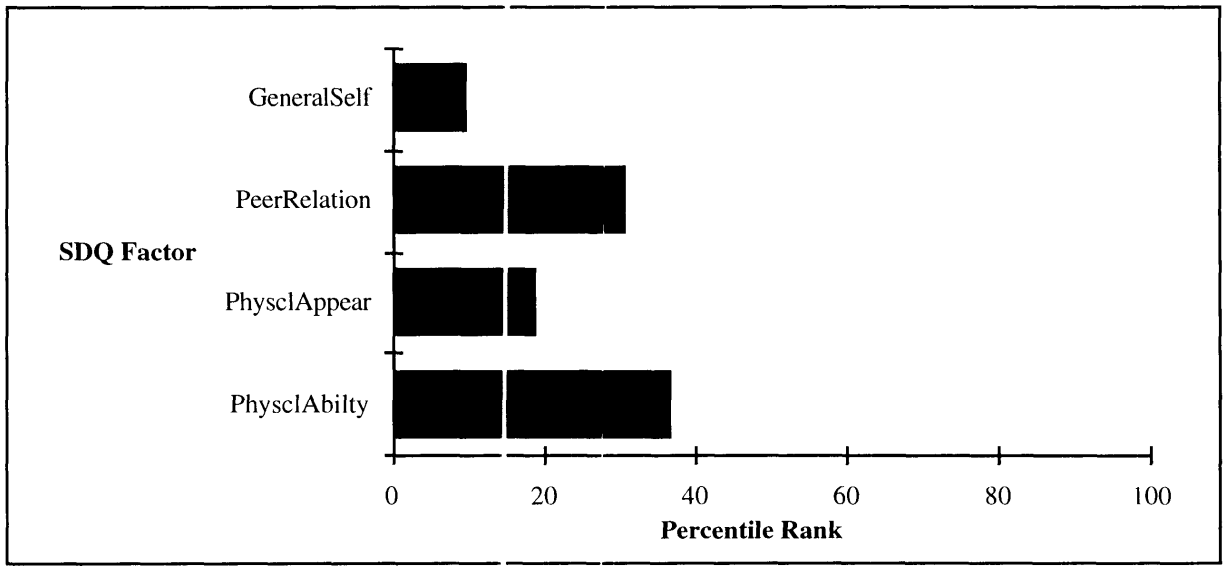

Figure 6.5 : Self-Description Questionnaire Factor Scores for Ann

This general area of assessment could be viewed as merely one to be aware of for Ann, rather than of major concern at this time. This is true as both her parents and the program instructors (see following) have regarded her as socially well adjusted with normal relationships and friendship patterns. Should her movement difficulties continue though, she may be affected adversely unless strong efforts are made to enhance her feelings of self-worth through other domains of endeavour.

PERFORMANCE ON THE PROGRAM

Ann attended every session of the Gymstart program and completed all of her homework tasks. Evaluation of Ann's performance during the program was established from three sources. Firstly, her results on the pre and post test screening procedure were analysed. Secondly, continual subjective assessment by Ann's program instructors, documented in their final reports, were recorded. Thirdly, parental information about progress during and since the program, from either of the interviews, contributed to the overall evaluation.

Pre and Post Test Results

Ann's performance on the screening procedures varied slightly, in that for most items, with two exceptions, she improved from pre to post test. Figure 6.6 shows her scores on the items from each of the test trials.

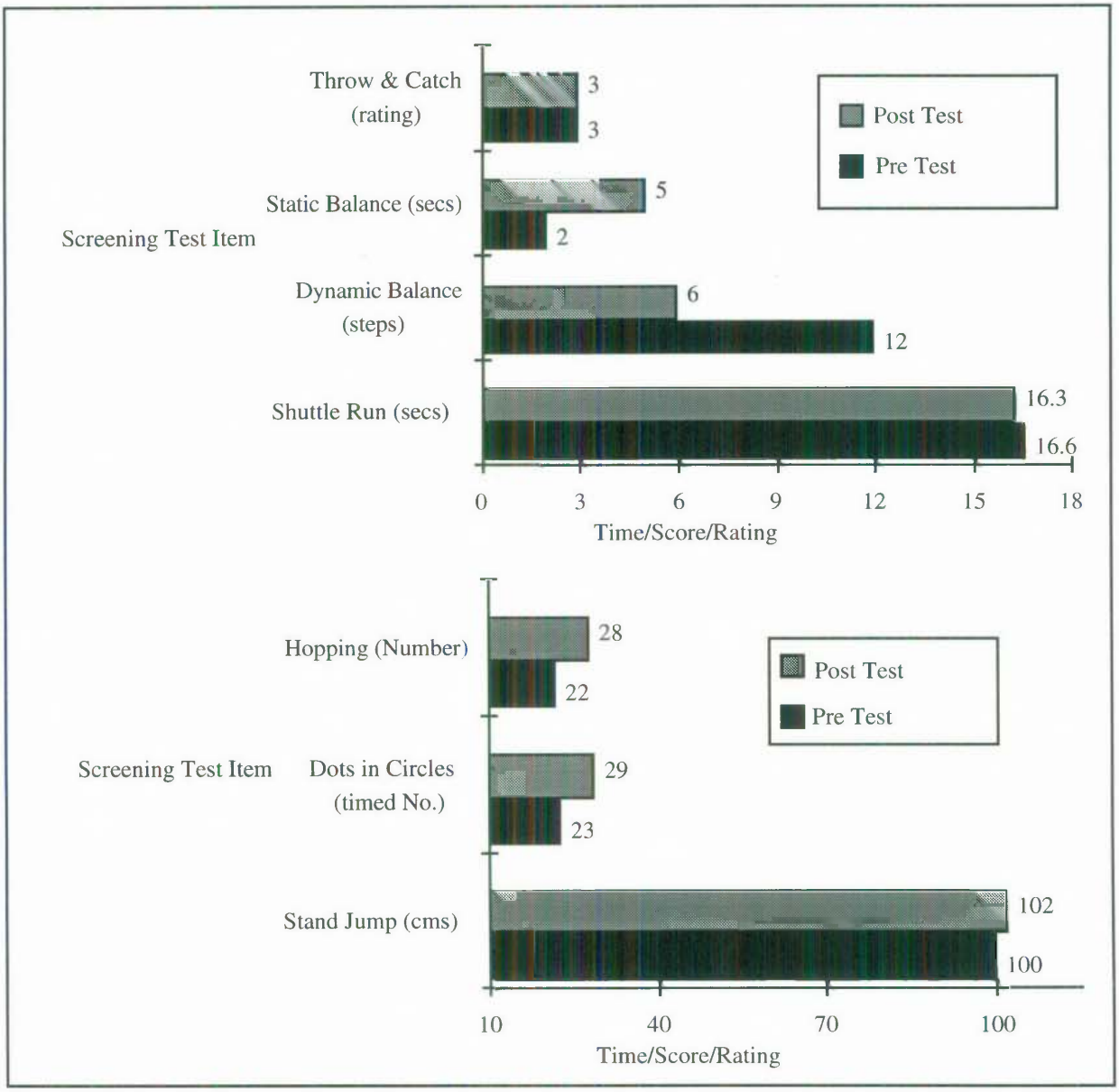

Figure 6.6 : Performance on Pre and Post Screening Tests - Ann

Closer analysis of the items reveals that for five items she improved her score from pre test to post test, stayed at the same level for the throw and catch task and scored less on the dynamic balance task. There are little or no substantial differences between some items in practical terms, across the two trials, e.g., hopping, dots, jump and shuttle. However, the changes in the balance tasks, i.e. a 150% improvement in static balance and a 50% decline in dynamic balance could be interpreted as substantial. The nature of these more substantial changes, considering the high correlations found across these items for the normal population (see Chapter 4), emphasise the inconsistency of skill transfer shown in the study group. In addition, the pre-test screening determined also that Ann has cross dominance from eye to hand, i.e., she is left-handed and right-eyed.

Comments from Instructors

Instructors comments regarding Ann's skill levels and development have been analysed and reported previously. This sub-section summarises comments from the instructors regarding Ann's attitude, socialisation, motivation and any other relevant general comments not reported earlier.

> Ann's progress was most pleasing and her consistent efforts commendable. She was a joy to work with, being of a likeable disposition and always enthusiastic to complete the activities to the best of her ability. Ann's easy nature and cooperation ensured that she always participated wholeheartedly in group activities and she related well to others. In both the warm-up and concluding games, Ann interacted well with her peers and socialised in a pleasant and agreeable manner. After instruction and practice, Ann's skills improved significantly, she listened and observed intently and followed instructions well. She enjoys sporting involvement, despite her limitations and has the potential to be able to participate positively in sport in the future. This is always provided she continues to be involved in physical activities of varying and diverse natures and gets some individual assistance in developing aspects of motor coordination.
>
> Besides the work with Ann in the motor domain some indicators of perceptive processes were able to be observed. Activities were included which involved visual and auditory awareness and these found Ann to be proficient in both these areas. She demonstrated good perception of visual and auditory stimulus and responded appropriately. Both instructors were able to extend Ann's motor skill repertoire and bring about an understanding of a wide range of activities.

These comments suggest that Ann is well adjusted socially and despite her difficulties her confidence remained intact. Although her skill level is still at the lower end of the scale, she has shown improvement and a positive response to the Gymstart program.

Her Parents

As mentioned at the start of this case description, Ann's parents attributed a steady improvement in Ann's movement skills and level of self confidence to participation in the Gymstart program. They reported a marked improvement overall, particularly in her

demonstration of ball skills. Her motivation to participate in sports had increased, with her parents relating an initial interest in hockey, where she experienced some success. However, this interest waned, mainly due to social and friendship reasons. She now plays netball to be with her friends and takes swimming lessons, where improvement is slow due to difficulties in breathing technique.

Summary

There is no conclusive evidence that Ann improved her skill levels as a result of participating in the Gymstart program. However, anecdotal qualitative judgements and subjective comments provided by a variety of sources, have suggested an improvement in both her self-confidence and motor skill abilities. She responded well to instruction and showed some very positive attributes pointing to an optimistic prognosis, despite her difficulties.

IMPLICATIONS FOR THE RESEARCH FINDINGS

In comparing an individual from within the study group, to the group itself, much can be gained by the demonstration of trends through the detail of individual examination. To a large extent, Ann is typical of the study group as a whole, exhibiting many of the characteristics which were reported as group trends in the last three chapters. In terms of the descriptive analysis in Chapter 3, Ann could be said to possess the following attributes which characterised the study group as a whole:

- Ponderous build;
- Body composition high in subcutaneous fat;
- Mechanical disadvantage in the proportions of limb segments;
- Height, weight and skinfold readings tended to characterise as tall and overweight;
- Fitness level is low;
- Lacking stamina, speed and strength;
- High level of flexibility;
- Neuromuscular ability level is low;
- Fine motor skills are generally lacking with even lower levels of gross motor function;
- Hereditary factor;
- Birth trauma;
- Willingness to participate and cooperate in remedial activities;

and, attributes which tended not to characterise the study group:

- The family environment was unlikely to have caused limitations to participation in physical activity.
- Self-concept not being a detrimental factor to movement inabilities. In fact, the corollary is also true, namely, the inabilities have not as yet been detrimental to her self-concept.

A comparison of this list pertaining to Ann, with a similar list compiled as a consequence of the findings in Chapter 3 (see page 87), shows Ann exhibiting identical characteristics to those of the group on fourteen of the seventeen group characteristics.

In terms of reflecting the trends shown by the study group, Ann's skill profile, as a whole, would reflect that of the group. A profile of low scores on the MAND test, difficulties in fundamental movement attributes, and coordination difficulties, are all aspects which exemplify the group. Furthermore, inconsistent results across screening test items and between the pre and post tests would reinforce the findings of Chapter 4, which suggest a lack of transfer in skill abilities.

In the cluster analysis, Ann's results demonstrate trends which are indicative of her cluster group, in that as an individual she exhibited very similar characteristics to the group that formed the cluster containing the largest number (n=9) of children drawn from the cohort. The analysis in Chapter 5 showed that children in this group exhibited the following: a low Crural Index; moderate to mild disability ratings on NDI; and, high levels of body fat. These characteristics typified the characteristics of cluster 1. Figures 6.1, 6.2 and 6.3 show that Ann's scores for these parameters give a very similar profile in this respect. In general, Ann's results have reinforced the findings of the previous chapters, representing in an individual, the main characteristics of a group.

OVERVIEW

Ann was born one week prematurely, with some minor birth trauma. She has a blood disorder which has led to fairly major surgery at a young age. Apart from this, Ann developed largely in a normal manner during infancy and is particularly well adjusted socially. Her home environment is stable and she has exhibited normal patterns of play as well as interest in, and access to, physical activity. There is a possibility that some of her movement difficulties can be attributed to hereditary factors.

Generally, in terms of physical capacities and skill attributes, Ann typifies the Gymstart group. She exhibits many of the characteristics of the group shown in the previous three chapters. Ann is a very tall and heavy girl, with a level of body fat considered to be overweight. She may well be deficient in musculature, as her appearance is not stereotypical of obesity and other indicators suggest muscular weakness. Ann's excess body fat, combined with mechanical inefficiencies of her upper and lower limb proportions, adversely affect her movement performance. In addition to this, as a consequence of her health problems Ann experiences a low level of general physical fitness. In particular, Ann's stamina and strength capacities are deficient in comparison with her peers, although she performs normally in jumping tasks and has above average flexibility.

Assumptions can be made to explain the divergences from the general trend in Ann's physical prowess. Her high rating on flexibility is typical of the 'floppy' type of clumsy child. This was reported by Larkin (1994) who suggested the lack of musculature actually enhances performance on flexibility measures. This means that hyper-flexibility has a negative effect on performance when accompanied by a lack of strength. The better performance on the jumping tests may be a function of Ann's height and the tests being product-oriented. There is no doubt, however, that Ann's fitness level is poor and certainly would lessen her ability to perform on movement tasks.

Ann has mild to moderate motor dysfunction and this impaired neuromuscular ability would be deleterious to participation in normal physical activity. However, this would be a considerable impairment to the tasks of everyday living and any prospective employment which utilised any manipulative skills. Analysis of Ann's skills by instructor and video observations, has revealed difficulties in static balance with an acceptable level in some dynamic balance activities. Ann has some difficulty with more advanced skills, including throwing, catching and hitting. Despite this, she responded well to the remedial program in all aspects of skill development, showing cooperation and a keen attitude to learning. Ann's persistence and personality contributed to her achieving levels of skill which are acceptable socially in most games and sports. This very positive response to the remedial program, reported through parent and program instructor comment was confirmed on video. It would seem that Ann's persistence and personal fortitude have delivered at least levels of skill which can enable her to participate in most physical activities.

Ann's scores on the self-concept scales tend to indicate that she fosters a certain negativity towards herself. Scores on the items that indicate her feelings about her physical ability and relationships with her peers, can be considered normal. Ann seems to have some doubts about her general self and is questioning aspects of her physical appearance. However, this general area is merely one to be aware of for Ann, as both her parents and the program instructors regarded her as socially well adjusted with normal relationships and friendship patterns. Ann has the self assurance to participate in a normal range of sports or physical activities and the remedial program has enhanced some of her skills that may contribute to that participation. Should her movement difficulties continue, she could be adversely affected and efforts should be made to reinforce her feelings of self-worth in other domains of endeavour.

CASE 2 : LANCE

Lance was seven years of age when he was referred to the UNE Gymstart program by his teacher. He is the first born of two children, with a sister four years younger than himself. Both of Lance's parents live at home and, currently, his father and mother are pursuing tertiary qualifications. Lance's father regards himself as 'inadequate' in sports and general coordination. Whereas, Lance's mother sees herself as well coordinated but 'unathletic'. Lance's sister is considered well coordinated by her parents.

Lance experienced significant trauma during home birth. He became stuck at the pelvic bone and required hand manipulation by a midwife to allow his head to move down the birth canal. Lance was born with head disfiguration, and a motley appearance and discolouration which was attributed to oxygen deprivation He is prone to tonsillitis and has an inherited sinus condition. Lance has been slow to reach the normal developmental milestones, such as walking and talking.

Lance changed his given name to all people, except his parents. He is known as Mike to his teacher and all his friends. The change came about during kindergarten, when he was taunted by other children, as his name was associated with a TV commercial. Lance had not been referred to any other professionals, other than the UNE program, in connection with untoward health, development or movement difficulties. His parents noticed a dramatic improvement in his physical skills and confidence since his involvement in the Gymstart program.

PHYSICAL CAPACITIES

An impression of Lance's anatomical structure can be gained through analysis of Figure 6.7. He is a tall boy and his weight and level of body fat (15% of total body weight) lies within a normal and healthy range. From these three indicators, Lance's body build and stature would neither give him an advantage nor a disadvantage in the performance of movement tasks.

Further analysis of Figure 6.7, reveals a low percentile ranking for Lance's Relative Sitting Height, very low rankings for his Brachial Index and very high rankings for Crural Index. The raw data for these indicators show a Relative Sitting Height of 51, giving him a proportionality of trunk to leg length of approximately 50 : 50 of total height. Given that the norms have such a small range and standard deviation, Lance's Relative Sitting Height would not be considered a mechanical disadvantage. The two indices of limb proportions, however, show a marked deviation from the normative mean in absolute terms. His high Crural Index reading of 139, represents a longer calf to thigh proportion and could provide Lance with an advantage in jumping tasks.

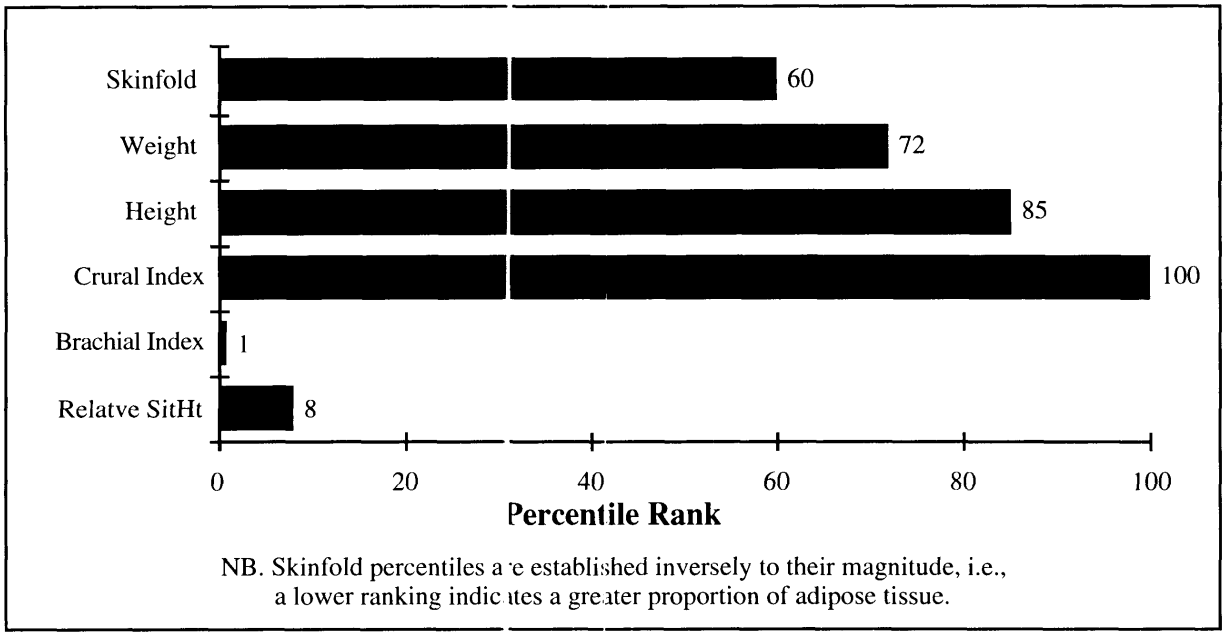

Figure 6.7 : Anthropometric Profile for Lance

Lance's low Brachial Index, denotes an upper arm segment length longer than the forearm, which could disadvantage him in skills, such as, throwing. This disproportion in limb segment lengths at both extremes, seems a little unusual but is evident in other children in the group.

FITNESS LEVEL

Lance's profile of his percentile rankings for fitness parameters is presented in Figure 6.8. In general it indicates low fitness. Lance's inability to work continuously at the whole body level, is demonstrated in his low ranking on the stamina test (800 metre run). In the more localised endurance level his capacity is also low, as indicated by his abdominal strength ranking (from a 60 sec. sit-up test).

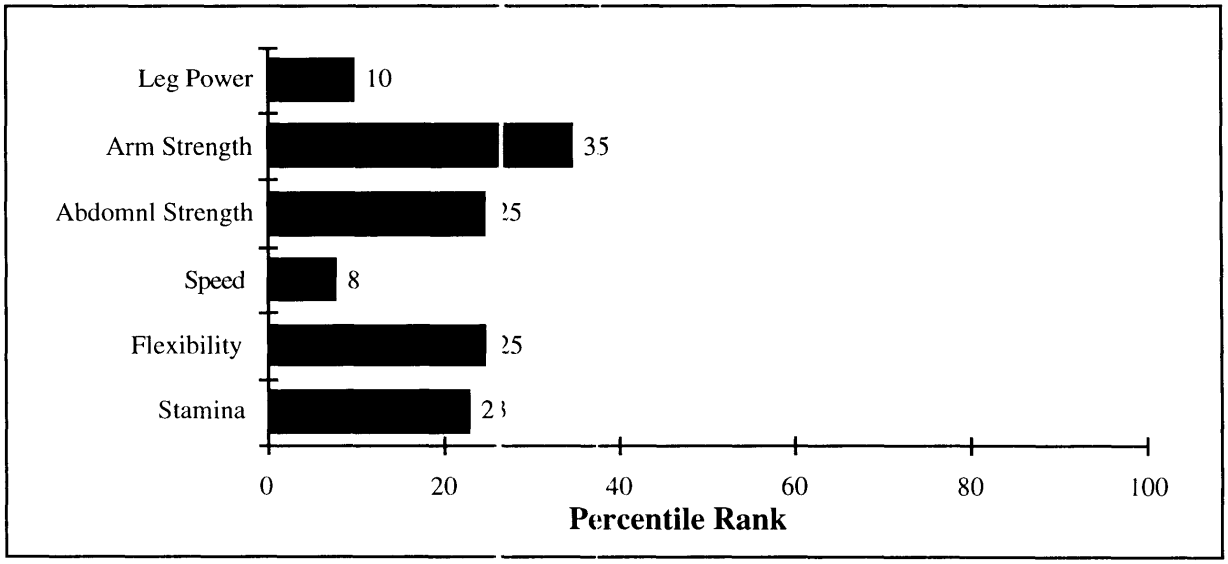

Figure 6.8 : Fitness Profile for Lance

The likelihood of a mechanical advan age in lower limb proportions suggested previously, is dispelled by his low rankings on spee d (50 metre sprint test) and leg power (vertical jump) rank. Generally, Lance's strength, pow er and stamina ratings are poor and he is one of the few in the study group to show low flexibility (sit and reach test). Lance's low fitness level would certainly detract from efficient physic l performance.

MOTOR SKILLS

Using the same forms of assessment as in the previous case profile, the evaluation of Lance's motor skills took place using three sources of information. Those sources were: the McCarron Assessment of Neuromuscular Dysfi nction (MAND); continual subjective assessment by Lance's program instructors; and, a vi leo recording of Lance which took place during two of the program sessions from which targ ted skills were analysed.

MAND Test

The MAND scores for Lance, indic ate a motor impairment level of major concern. His profile of the neuromuscular develop ment index (NDI) or motor quotient and the specific factor scores can be seen in Figure 6.9. Lance is considered mildly disabled on his overall neuromuscular development, as indicated by the NDI, likewise with the kinesthetic integration (KI) factor score. He is considered moderately disabled on muscle power (MP) and persistent control (PC) factor scor es, with a severe disability in bimanual dexterity (BD).

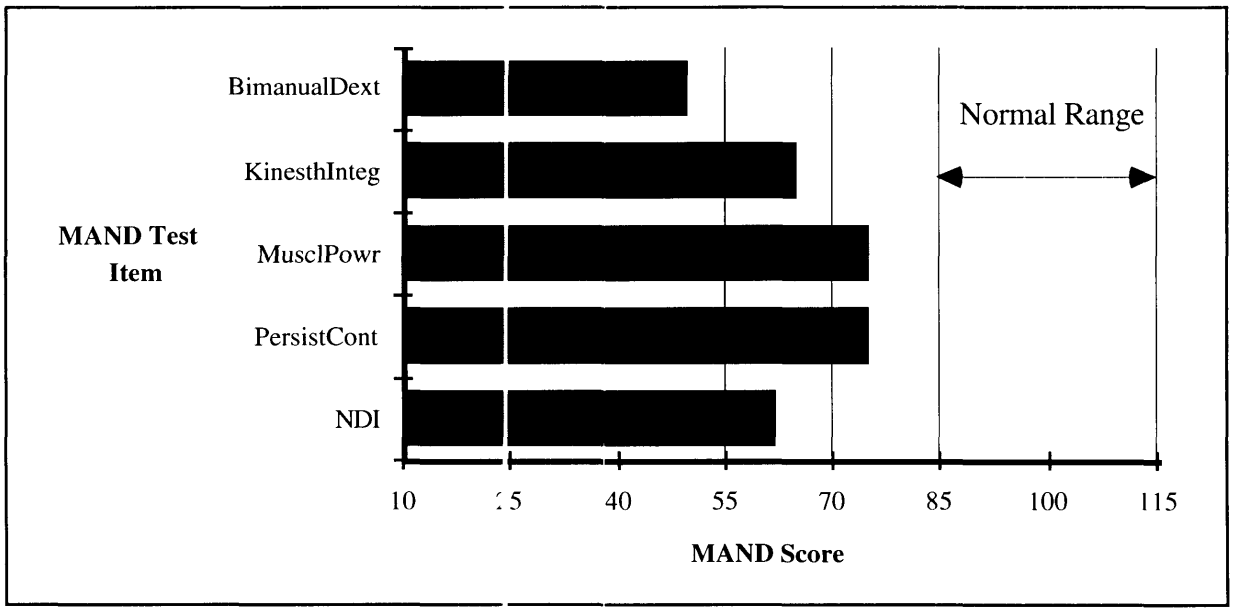

Figure 6.9 : MAND Test Factors Profile for Lance

A profile of Lance's performance on i ndividual items of the MAND test is provided in Figure 6.10. He has a relatively inconsistent profile with severe disabilities on the hand strength and nut and bolt tasks, moderate disabilit es on the finger tapping and finger-to-nose tasks, mild

disabilities on the heel-to-toe walking, beads-on-rod and standing-on-one-foot tasks, and scores on the remaining three tasks fell within the normal range.

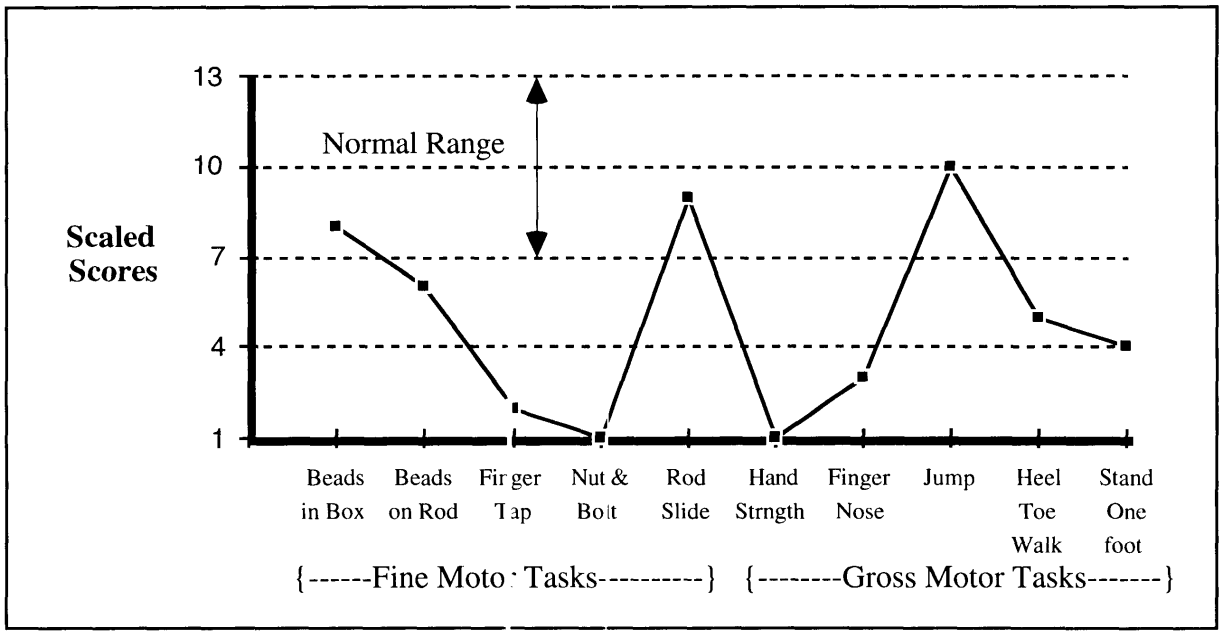

Figure 6.10 : Individual Profile of Neuromuscular Development for Lance on the MAND Test

Lance demonstrated inconsistency within each group of tasks, i.e., both fine and gross motor items. His scores in the two groups contributed just about evenly to his motor quotient, with an aggregate of 26 in the former and 23 in the latter.

Video and Instructor Observations

Instructor observations of Lance, documented in their final reports, resulted in extensive comment on his movement skills throughout the Gymstart program. In addition, particular aspects of Lance's skills were analysed through the use of video recordings, taken at two sessions. The following observations were made by combining the following: information from the transposition of the video material, through the camera operator's report; analysis of the video by the research director; and, instructor comment.

Lance found it difficult to maintain balance with his eyes closed while standing on one foot. Given that his dynamic balance was shown to be satisfactory, he perhaps has a strong reliance on visuo-spatial feedback for static balance. During the program there was some improvement in this area but he continued to show difficulty. Lance's dynamic balance skills, in comparison to the rest of the group was quite good. When walking along the balance beam and in straight lines marked on the floor, he had little difficulty. Lance has a normal gait and had no trouble moving about, looking fairly fluid in his running style. He was confident in his approach and used his ankles, knees, hips and arms to maintain his balance when necessary.

With jumping, Lance experienced slight difficulty at first. However, he improved both technique and distance during the program. His hopping and step-skipping skills were very good. Lance's rope skipping was satisfactory. He skipped over the rope with his ankles, knees and elbows bent on the downward swing. His head and trunk position were erect with eyes focused on a fixed object. As the rope was about to pass under his feet he would extend his body forward with the leap using his body position for momentum and then flex his whole body straight with toes pointed to complete the jump. Arm action on the rope was controlled and confident.

Lance often used his arms to catch a ball rather than his hands. He closed his eyes when the ball got close to him. He could not catch with one hand. Lance found it easier to catch bigger balls with both hands. He explored many different ways of throwing a ball and at different levels. His chest passes, underarm and overarm throws, were strong and accurate. This was one of Lance's real strengths.

Lance's bouncing skills improved considerably. He showed control when bouncing the ball and he could walk and run while bouncing. Lance did not progress to a real hand-dribbling technique. His kicking skills were good and he showed good ball skills when dribbling with his feet. Lance was able to trap the ball with confidence and his ability to control the ball was effective. He kept his eyes on the ball during the period he was dribbling, showing good balance and spatial awareness. Lance's kicking was usually with the top of his foot and was rigid in application. He looked at the ball rather than the destination, with his body position facing straight at the target rather than side on. Lance's back-swing and follow-through was in line with the target. He showed control over the power required for each distance kicked. He moved to the ball and showed good position to receive it. The ball usually stopped when trapped and he maintained a good sense of balance through the entire task.

Lance's fine motor skills are not good. He is impatient with careful work, tending to rush it regardless of quality. Therefore, and given that Lance appears to have established a sound base of rudimentary and fundamental movement skills (Gallahue 1993), his poor performance on the MAND test is somewhat of an enigma. However, even scores on the MAND test were contradictory, in that Lance's profile (see Figure 6.10) ranges across test items from normal to severely disabled. The contradictory evidence points to some underlying but very specific neuromuscular irregularity which may be associated with movements of the hand in conjunction with forearm muscular action. This is evident in difficulties on gross motor activities, e.g., catching a ball, and the MAND test scores on finger tap, nut and bolt, hand strength and finger nose items. Combine this with Lance's 'dreamy' personal demeanour and minor movement deprivation, due to the lack of importance placed on movement experiences in the home, and at least some clues to his movement difficulties begin to emerge. Certainly Lance's perceived improvement in skill level (i.e., through instructor and parent observation)

would endorse the notion of some movement deprivation, as difficulties resulting from this cause, are usually responsive to remedial programs.

Summary

Lance's impaired neuromuscular ability, evidenced by the MAND test results, would reduce his ability to efficiently control any skilled movement. In addition, this level of dysfunction can be detrimental to the ordinary participation in physical activity and an impediment in performing the tasks of everyday living which utilise manipulative skills. Lance's inconsistency on test items in the MAND test reinforce the findings of the supplementary study.

Observation of his skills through instructor feedback and video analysis, revealed difficulties in static balance and satisfactory performance in dynamic balance and locomotor activities. He has some difficulty with coordination skills in terms of receiving a ball, e.g., catching. However, his projecting of the ball, as in kicking or throwing, is considered satisfactory. While Lance's fine motor skills are an area of concern, he responded well to the remedial program in some aspects of skill development. Lance's cooperation with his instructors has enabled him to improve his skills during the program. He is now on the way to achieving levels of skill which would be seen as acceptable in most social situations.

SELF-CONCEPT

Lance's results on the four scales of the Self-Description Questionnaire (SDQ 1) are presented in Figure 6.11. Analysis of the profile can provide indicators to Lance's self-confidence and some facets of global self-worth. The general impression is that Lance's scores on the self-concept scales, tend to indicate that he fosters a little negativity towards himself. However, caution should be used in interpreting these percentile ranked scores, in the same way as previously reported parameters have been interpreted. Only scores falling below the 25th percentile rank can be interpreted confidently as low or negative. In fact, Lance's scores on his feelings about all four of the SDQ factors can be considered normal. Given this, the only interpretation that can be made is that Lance has a better self-concept in the areas of general self and physical appearance than in the other two areas. Lance's results from the Self-Description Questionnaire would not indicate negative effects to physical performance.

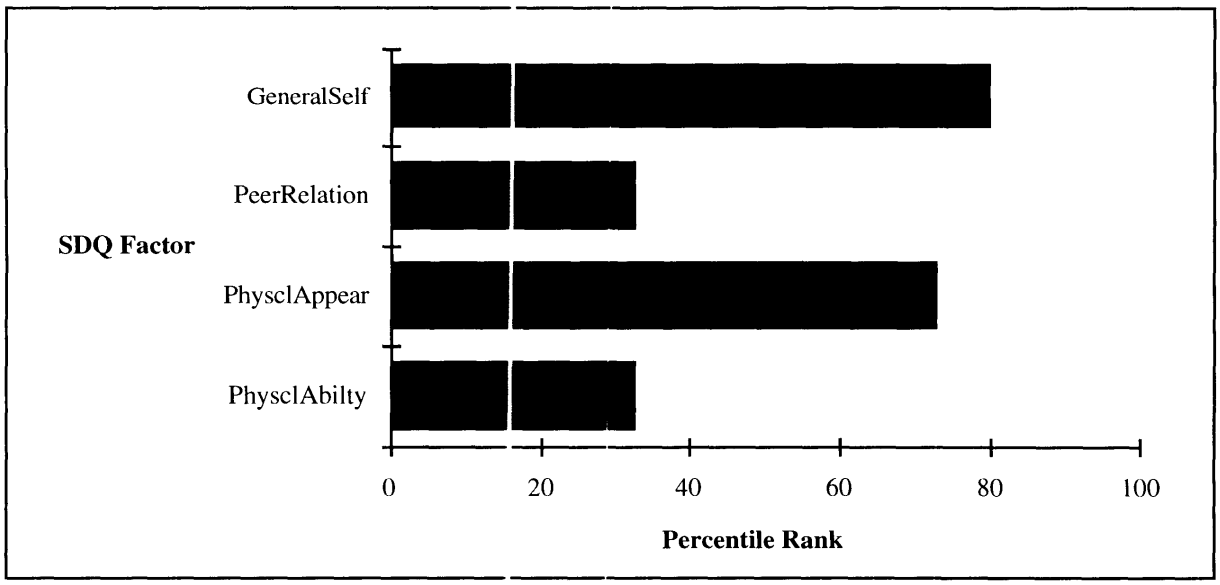

Figure 6.11 : Self-Description Questionnaire Factor Scores for Lance

PERFORMANCE ON THE PROGRAM

Lance was considered as a regular participant in the Gymstart program. He missed only one session and completed all of his homework tasks. Evaluation of Lance's performance during the program was established from three sources. Firstly, the results of the pre and post test screening procedure was recorded and analysed. Secondly, subjective assessment throughout the program were undertaken by Lance's instructors and documented in final reports. Thirdly, information from parents about progress during and since the program, was established from the interviews.

Pre and post test

Figure 6.12 shows Lance's scores on the items from each of the test trials, also the pre-test screening determined that Lance is not cross dominant from eye to hand, i.e., he is right side dominant. Performance on the screening procedures varied slightly, closer analysis revealing that for five items Lance improved his score from pre test to post test, stayed at the same level for the throw and catch task and scored less on the static balance task. There is no substantial difference between some items, in practical terms, across the two trials, i.e., static balance, hop, dots and shuttle. However, the improvement in two of the tasks are substantial, i.e., an 80% positive change in dynamic balance and an 11 centimetre improvement in standing jump. These more substantial changes are also indicative of the inconsistency of skill transfer shown in the study group, as considerable improvement in dynamic balance was accompanied by a slight decrease in static balance and the 11 centimetre increase in standing jump was accompanied only by a 0.1 sec. improvement in shuttle run speed. These pairs of items were shown to be highly correlated in the analysis of the normal group, which was reported in Chapter 4.

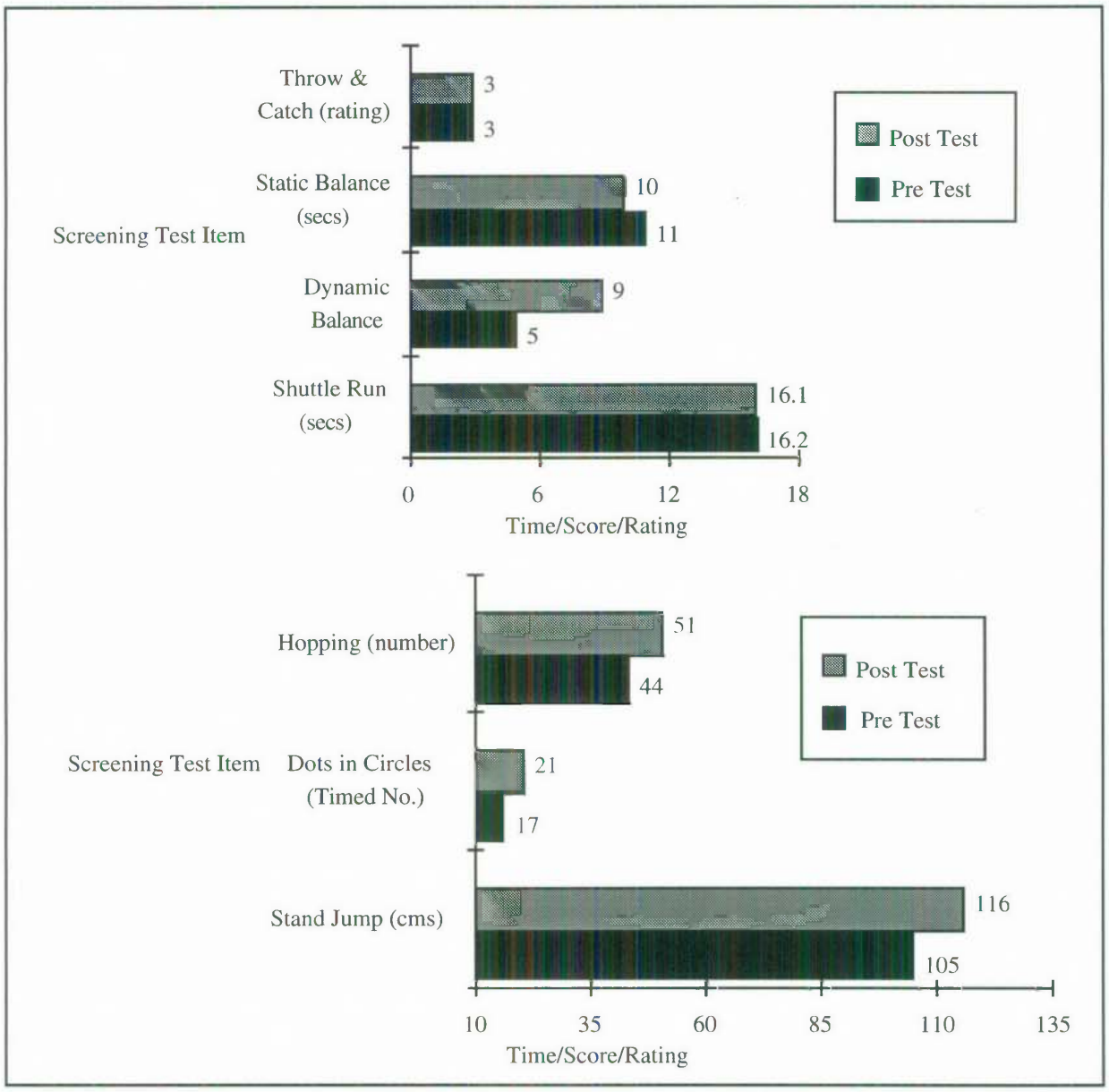

Figure 6.12 : Performance on Pre and Post Screening Tests - Lance

Comments from Instructors

Instructors comments regarding Lance's skill levels and development have been made previously. This sub-section summarises and synthesises comments from the instructors regarding Lance's attitude, socialisation, motivation and any other relevant general comments not reported earlier.

> Lance is a quiet shy boy and initially seemed to lack self-confidence. Over the course of the program Lance's self-esteem developed and grew. This was largely a consequence of familiarity with instructors, other children and the surroundings. Lance participated with enthusiasm in all the activities developed for him. He formed a close friendship with another boy in the group and tended to stick close to him. Lance is very good natured, he is considerate and always eager to help. Lance became a lot more talkative as the program transpired, he opened up a lot and showed much more confidence. Towards the end of the clinic he would greet

people with a smile and initiate the conversation. Lance enjoyed the activities and cooperated well throughout.

Lance's initial shyness indicates a probable lack of confidence in new surroundings. Apprehension to new situations may be a disadvantage in the learning of new skills, particularly in those associated with social situations, such as games skills. This may be one factor in Lance's difficulty with motor skills.

His Parents

Since participating in the Gymstart program, Lance has begun to tell his parents of events occurring at school relating to sports days and the like. Previously he would be reticent to mention any of this and his parents would have had difficulty in getting a response from Lance at all. He now shows pride in his school work, bringing home more examples of his endeavours. His parents have noticed a change in the way he deals with people outside the home, such as asking a shop assistant the cost of an item, paying, getting change and engaging generally in conversation with unfamiliar people.

Lance was bought a basketball for Christmas and he was constantly counting the number of times he could bounce the ball consecutively. He now can bounce it over 600 times and it is no longer is an issue for parent or child to continue to count. His father mentioned also that his handwriting and other fine motor skills had improved.

Summary

There is no overwhelming statistical evidence that Lance improved in any facet of development as a result of participating in the Gymstart program. Anecdotal and subjective comments provided by a variety of sources, have suggested improvement in both motor skill abilities and self-confidence. Lance responded well to the instructional program and showed some attributes and behaviour which point to an optimistic prognosis, despite his current difficulties.

IMPLICATIONS FOR THE RESEARCH FINDINGS

Lance, although possessing some attributes which characterise the whole group, is less like the group than the children in the other case studies. He is typical of the study group in the following characteristics:

- Mechanical disadvantage in the proportions of limb segments;
- Fitness level is low;
- Lacking stamina, speed and strength;
- Neuromuscular ability level is low
- Hereditary factor;
- Birth trauma;

- Willingness to participate and cooperate in remedial activities;

and, attributes tending not to characterise the study group:

- Family environment was unlikely to have caused limitations to participation in physical activity;
- Self-concept not being a detrimental factor to movement inabilities. In fact, the corollary is also true that the inabilities, as yet have not been detrimental to their self-concept.

A comparison of this list, with respect to Lance's descriptive characteristics, with the list compiled for the group as a whole (see page 87), shows him having a similar profile across eight of the seventeen group characteristics. Therefore, in terms of reflecting the trends shown by the study group, Lance's skill profile deviates by slightly more than 50% from that of the group. This would reinforce the findings in Chapter 5 which placed him, in the cluster analysis procedure, as the most independent of the children, on the characteristics used in the clustering process, until the final step of the analysis (see page 123). In that analysis, Lance's results demonstrate that he remained the most independent individual due to both: extremely low measures in two parameters; and, a high crural index rating, which reversed the majority trend. He was, to a certain extent, the exception which helped prove the rule.

OVERVIEW

Lance's birth was traumatic, involving some head disfiguration and oxygen deprivation. He has been slow to reach the normal developmental milestones, such as walking and talking. This history, together with deficits evident from the MAND test, may be indicative of some soft neurological damage but other indicators suggest inconsistency in the signs. Apart from this, Lance developed largely in a normal manner during infancy and is particularly well adjusted socially. His home background is stable, although the importance of physical activity has not been uppermost in the family environment until recently. There is a possibility that some of Lance's movement difficulties can be attributed to hereditary factors.

Lance is a tall boy with weight and levels of body fat within a normal healthy range. Although, he may have a biomechanical disadvantage in some upper limb movements this is offset with mechanical advantages of the lower limb. This disproportion in limb segment lengths at both extremes, is evident in other children in the group. Generally, Lance's stamina, strength and power measures rate low and he is one of a few in the study group to exhibit low flexibility. His low fitness level would detract from efficient physical performance.

Lance's impaired neuromuscular ability would reduce his ability to control efficiently any skilled movement. Although the MAND test results show equal difficulties with gross and fine motor tasks, he has particular trouble in the fine motor area, in a practical sense. Observation of Lance's performance, revealed difficulties in static balance and coordination skills, in terms of receiving a ball. He demonstrated satisfactory skills in dynamic balance,

projecting of a ball and locomotor activities. Lance responded well to the Gymstart program in some aspects of skill development. His cooperation with the instructors has facilitated improvement in his skills. Lance has the potential to achieve levels of skill which can be socially acceptable in most sports and games activities. He differed in a number of respects from the group, demonstrating an atypical physical capacities and skill attributes profile.

Lance is a quiet and shy boy, however, a placid nature does not indicate necessarily a lack of self-worth. He changed his given name for social reasons during his kindergarten years. In changing his name, he may have been demonstrating overtly some negative feelings towards himself. However, other indicators do not support this notion. Lance has positive relationships with both his peers and with adults. Generally, his scores on self-concept scales (measured by the SDQ) can be considered normal and would not indicate negative effects on or because of, movement abilities. Lance responded well to the Gymstart program and showed improvement in both motor skills and self-confidence.

CASE THREE : GRAHAM

Graham was six years of age when he was referred to the UNE Gymstart program by his teacher. He is the third born of three children, with a brother and sister sixteen years and fifteen years older, respectively, than himself. Both of Graham's parents live at home, his father and mother being educated to junior high school level. His mother regarded herself as a clumsy child but no other members of the family have coordination problems.

Graham was born after an especially difficult labour during home birth. Both the mother and Graham were distressed, with the baby requiring oxygen. The mother had a history of difficult births with both his brother and sister. She was almost 40 years of age at the time of Graham's birth. He was referred to a paediatrician by the community health nurse, as a consequence of slow language development. The advice given by the paediatrician was to mix more often with other children.

Graham's older siblings had moved away from home and there were few children in his neighbourhood. Graham's mother was rather protective of him due to his developmental difficulties but was persuaded eventually to allow him to attend a pre-school to overcome his problems. The family moved to a neighbourhood more conducive to Graham's needs, in terms of closeness to other children the move coinciding with the end of the Gymstart program.

PHYSICAL CAPACITIES

A representation of Graham's anatomical structure can be gained through analysis of Figure 6.13. He is a short boy and aesthetically his appearance gives the impression of normal height to weight proportions, although his posture appears rather slumped. However, his weight approaches the mean for his age with a level of body fat at seventeen per cent of total body weight. Graham is not overweight, despite his low percentile ranking for the sum of two measured skinfolds. The discrepancy between the latter rating and percentage body fat (calculated from four readings) being in the uneven distribution of adipose tissue across all four measured sites, i.e., the higher deposits just happened to be at those two sites used in the normative data. From these three indicators, Graham's body build and stature would neither give him an advantage nor a disadvantage in the performance of movement tasks.

Further analysis of Figure 6.13 reveals a low percentile ranking for Graham's Relative Sitting Height and very low rankings for his Crural Index and Brachial Index. The raw data for these indicators show a Relative Sitting Height of 47, placing him well outside a normal range with a trunk length proportionally shorter than his legs in the order of 8 : 9.

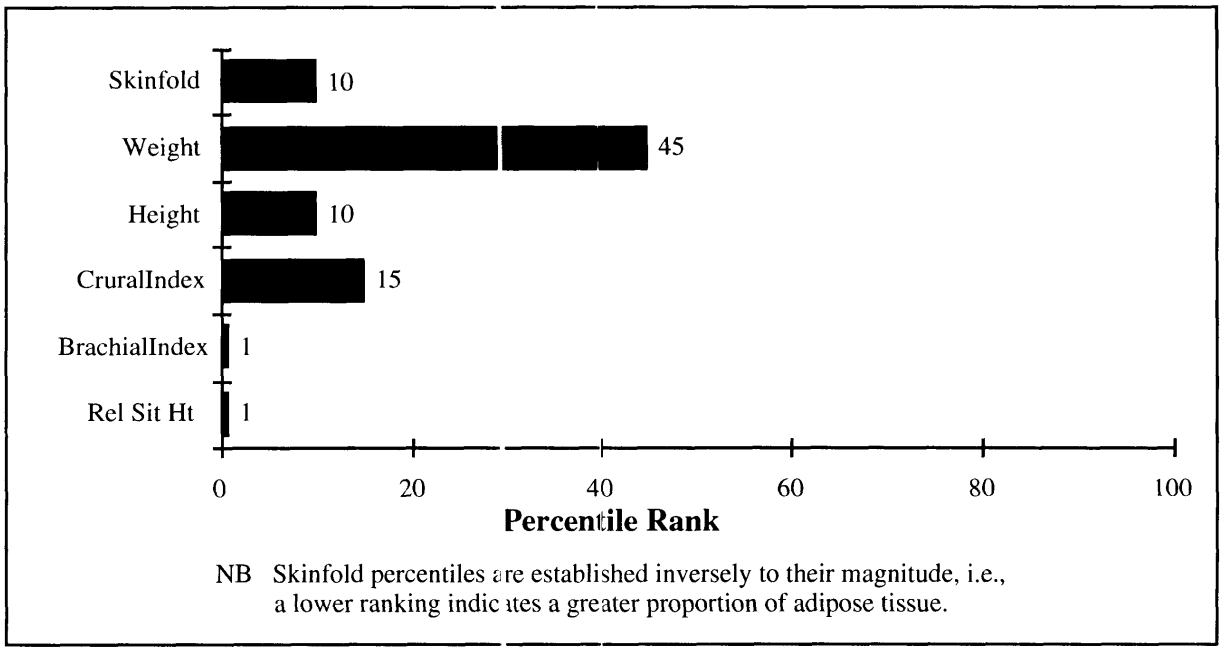

Figure 6.13 : Anthropometric Profile for Graham

However, this is unlikely to be of major significance biomechanically. The two indices of limb proportions, may produce a marked mechanical disadvantage for Graham in some movements. His low Crural Index reading of 94 denotes a longer thigh to calf proportion and his very low Brachial Index indicates an upper arm segment length almost twice that of the forearm. This disproportion in limb segment lengths, is likely to render Graham a mechanically inefficient mover.

FITNESS LEVEL

Graham's profile of his percentile rankings for fitness parameters is presented in Figure 6.14, generally indicating average to low fitness.

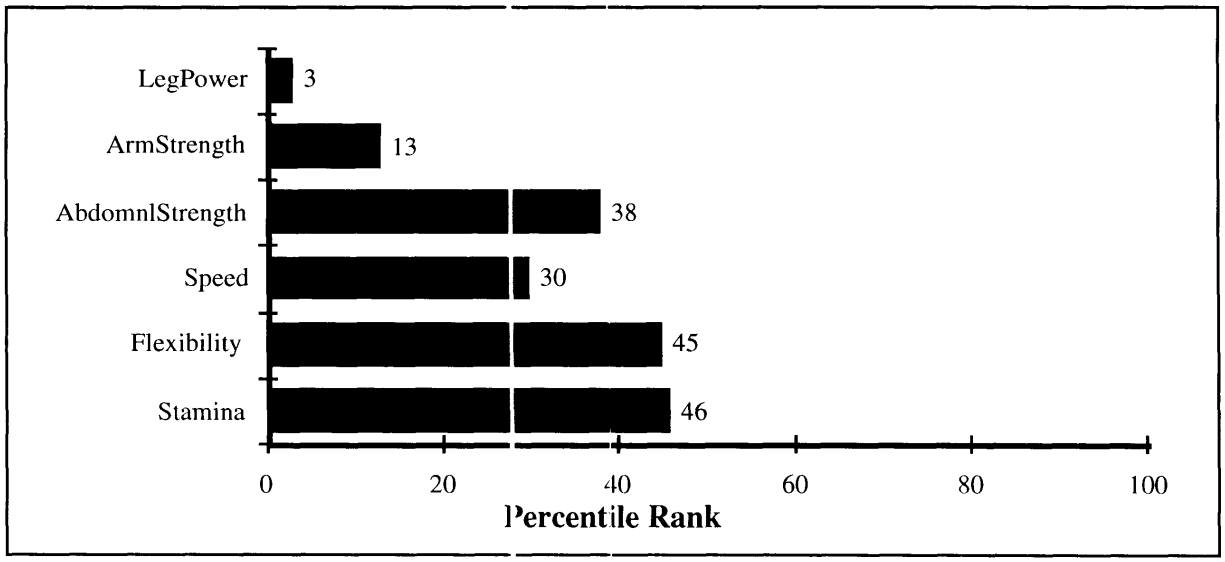

Figure 6.14 : Fitness Profile for Graham

Graham has reasonable stamina (800 metre run) and flexibility (sit and reach). Whilst not good, both could be considered in a normal healthy range. However, there is a marked lack of strength, speed and power. The only departure from this trend being in abdominal strength, even that being of some concern. Certainly, some aspects of Graham's fitness level would detract from efficient physical performance, although generally he fares better than the study group.

MOTOR SKILLS

There were three forms of evaluation of Graham's motor skills. In the first of these, his neuromuscular development was assessed using the MAND test. A continual subjective assessment by Graham's program instructors, documented in their final reports, formed the second method of evaluation. Lastly, a video recording of Graham's motor behaviour, filmed during two of the program sessions, from which targeted skills were analysed.

MAND Test

The MAND scores for Graham indicate a motor impairment level of some concern. His profile of the neuromuscular development index (NDI) or motor quotient and the specific factor scores can be seen in Figure 6 15. Graham is considered moderately disabled on his overall neuromuscular development as indicated by the NDI. He is considered mildly disabled on muscle power (MP) and persistent control (PC) factor scores. Graham has moderate to severe disability with his kinesthetic integration (KI), yet displays a bimanual dexterity (BD) factor score within the normal range.

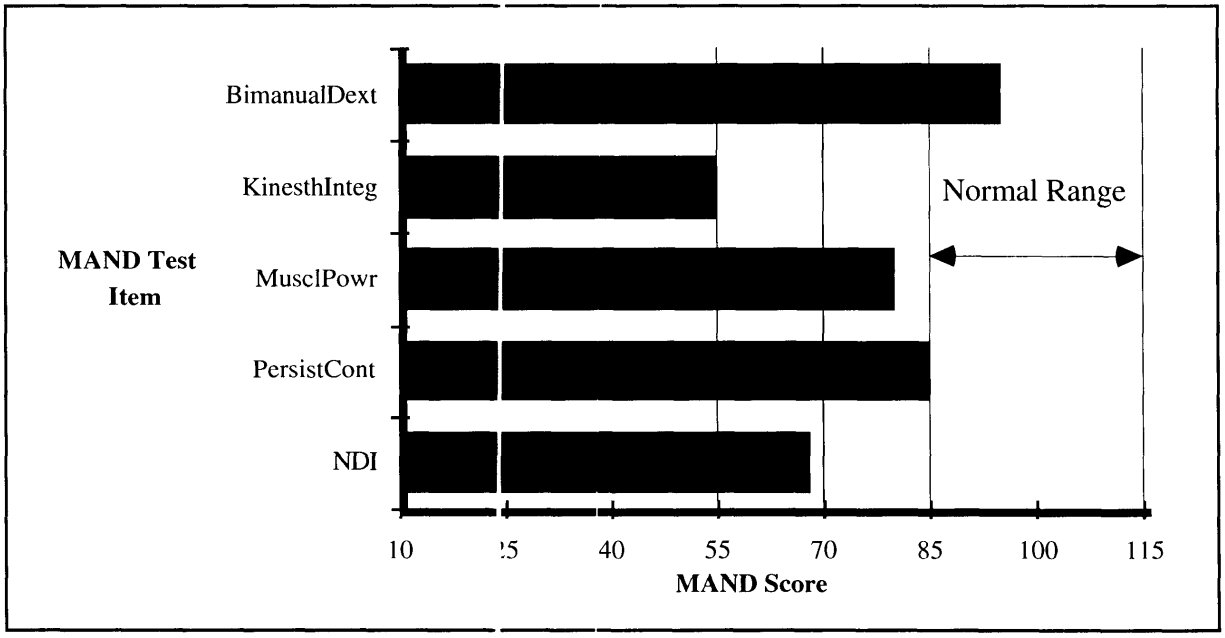

Figure 6.15 : MAND Test Factors Profile for Graham

A profile of Graham's performance on individual items of the MAND test is provided in Figure 6.16. He has a relatively inconsistent profile with severe disabilities on the heel-to-toe walking and beads-in-the-box tasks, moderate disability on the hand strength task, mild disabilities on the finger tapping and standing-on-one-foot tasks, and scores on the remaining five tasks fall within the normal range.

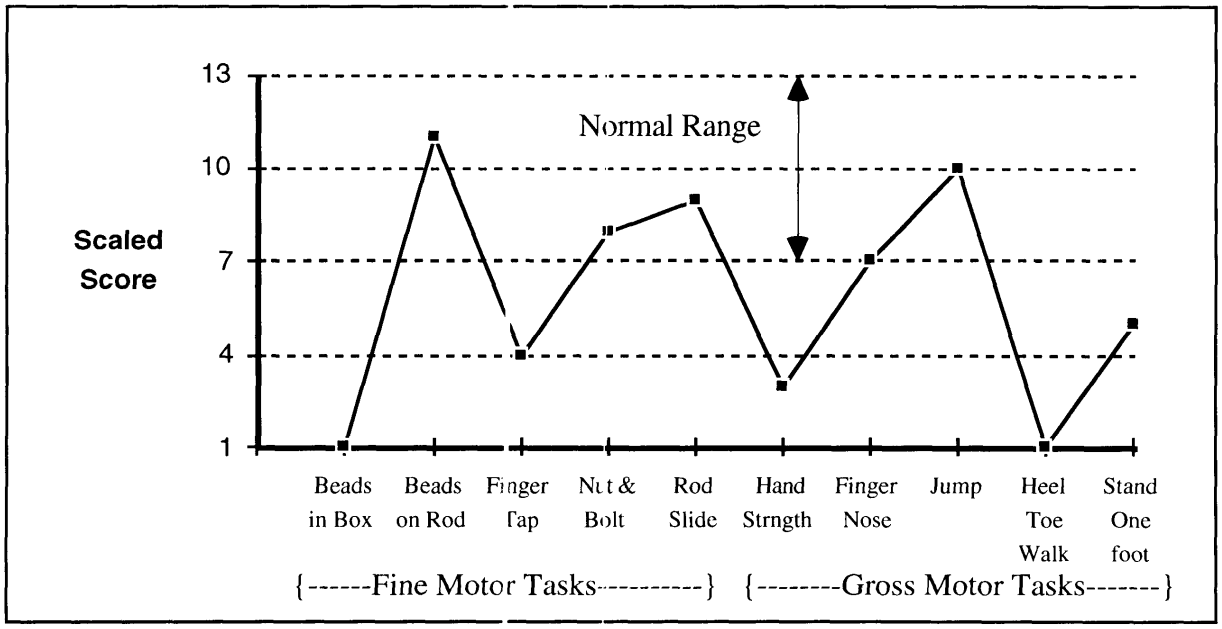

Figure 6.16 : Individual Profile of Neuromuscular Development for Graham on the MAND Test

Graham demonstrated inconsistency within two groups of tasks, i.e., the range for fine motor items being scores of one to eleven and the range for gross motor abilities being one to ten. His scores were better in the fine motor area, with an aggregate of 32, than they were in the gross motor area aggregating 26.

Video and Instructor Observations

In a similar format to the previous case profiles, instructors' observations of Graham throughout the program resulted in extensive comment on his movement skills. These comments were contained in the instructors' final reports. Also similar to the earlier sections of this chapter, specific aspects of Graham's skills are described, which were taken from the analysis of the video recordings from two Gymstart sessions. The following observations were made in combining the transposition of the video material, through both the camera operator's report and analysis by the research director, with the instructor comment.

Initially, Graham was unable to balance on one leg without falling over. He is now able to stand on one leg at a time, with his arms extended and his eyes looking forward. One of Graham's main problems is his inabil ty to maintain his balance when executing a movement. However, this has improved over the duration of the program. Graham's body positioning and

spatial awareness appears somewhat awkward. When walking along a line he stumbled after the first few steps. This pattern was repeated on subsequent attempts. Graham needed to be told to extend his arms for general balance. His balance improved when focusing on a set object, with head and posture assuming a more normal position.

Graham had an unusual gait, he appeared rather slouched and when he walked he took short strides. His walking style and his posture has since improved. He now stands with a straighter posture and walks with his feet pointing forward rather than inward, as they did before. Although Graham's walking has improved, to the stage where he can now walk without looking awkward, he reverts to the unusual gait when anxious. When Graham runs he has great difficulty and appears ungainly. His body positioning has a marked forward trunk lean and his arms and legs do not move in opposition. Graham has problems with heel-to-toe strike and his arm and leg drive is minimal. He has a tendency to wave his right hand in a whipping motion from the elbow. However, it is an area which has seen improvement, due partly to his increased fitness and improved flexibility, as well as greater awareness and the results of practice.

Graham has trouble with jumping, finding it difficult to jump off or land with two feet. He is improving but still needs a great deal of attention. When jumping for height, Graham has improved, no longer falling when swinging his arms upwards. Graham needed to be taught how to give with his body by flexing at the knees and ankles. On landing, he does not automatically flex the joints in his lower limbs to dissipate momentum.

Static balance, dynamic balance, walking/running technique and jumping are crucial in developing movement skills. As with Ann, Graham's deficits in these areas greatly disadvantage him in forming a strong structure of rudimentary skills upon which fundamental skills are based. This lack of capability in these areas, restricted neuromuscular control, weak musculature, serious posture and balance difficulties, is less evident in the study group but observed frequently in clumsy children as a 'slow and rigid' type. In addition, Graham's biomechanical disproportionality, in terms of very low brachial index and relative sitting height, somewhat exacerbate these disadvantages. In considering those factors, the remaining evaluation of skills which are based on a sound foundation can be assessed.

Graham's hopping has improved, he does not fall as often and seems stronger in his legs, enabling him to hop for longer periods. He can now hop on the spot and for a distance of about five to six metres. Although his right leg is stronger than his left, he is able to hop on both legs. Graham cannot step-skip at all, he adopts a galloping technique instead.

Graham is able to throw, rather inaccurately, with one or two hands but is stronger on the right side. Graham's overarm two-handed throw makes him lose balance and his underarm

throwing is less accurate. He does not display a lot of confidence with his throwing and tends to use too much power with little control over the action. When Graham was throwing the large ball at a target, he tended to throw the ball with a round arm action causing him to unbalance. On a few occasions he did throw the ball underarm and showed good technique. Graham's perception of distance or power seemed lacking but once assisted his accuracy improved. He is timid when catching balls, especially the larger ones. He tends to let the ball fall into his arms rather than reach out to the ball. Graham does not use his hands when catching, showing little control. Single-handed catches are very difficult for him, as the ball jumps out of his hand each time he attempts a catch.

Bouncing a ball is an area where Graham has improved overall. Initially he was only able to bounce a ball using two hands but now is confident with bouncing a ball with one hand. Graham showed a tendency to bounce the ball as high as possible rather than with a controlled action. His back-lift, strike and consequent follow through was too strong. Graham grasped the idea of how to bounce the ball and his main difficulty was with the regathering of the ball on the up-phase, i.e., when bouncing the ball, he had difficulty reaching the ball before it returned to the ground. After much practice, Graham can dribble a basketball on the spot with his left and right hands and is now able to look away briefly while bouncing. In addition, he can bounce a ball using a bat, although not repeatedly.

Graham lurches at the ball when batting or hitting and tends to sweep it away from himself. He was able to hit a ball with his hand and progressed to hitting with a bat. At the end of the program he gained more control of his actions with the bat but there was still much room for improvement. Graham can kick a ball accurately along a line and between markers. He kicks both a stationary and moving ball but often cannot coincide his movements with those of a moving ball. His feet get crossed over and he tends to put the wrong foot out to kick. Graham is able to kick with his right and left foot but is much stronger on his right. Because of his poor balance, he initially preferred to kick with his non-preferred foot, using his preferred leg for balance, as he prepared to kick the ball.

Graham had no difficulties in areas of fine motor skill which were addressed during the program. In the main, on fine motor tasks which were mainly using a pencil, he showed remarkable expertise in comparison to his gross motor skills. This observation is borne out by scores on the MAND test, with Graham's profile (see Figure 6.16) having three fine motor test items in the normal range and the fine motor aggregate score contributing more to NDI than did the gross motor component.

Summary

Graham has a motor impairment level of some concern. On overall neuromuscular development he is considered moderately disabled. Graham's scores show large discrepancies on MAND factors, ranging from severe disability on kinesthetic integration to normal on

bimanual dexterity. He has a similar profile on individual MAND tasks, with scores spanning across a wide range. Again some inconsistency in scores across individual test items support the findings presented in Chapter 4. Analysis of Graham's performance through video and instructor observations, reveals difficulties with balance, locomotion and ball skills. Although Graham has some difficulty with the fine motor area, a good proportion of his difficulties lie with the performance of gross motor skills. This motor dysfunction would decrease his capacity to plan and control for efficient performance of movement tasks. Graham's level of dysfunction would be detrimental, not only to the performance of everyday participation in physical activity, but also to any future endeavours which utilised manipulative skills.

SELF-CONCEPT

Graham's results on the four scales of the Self-Description Questionnaire (SDQ 1) are presented in Figure 6.17. Analysis of the profile can provide indicators to Graham's self-confidence and some facets of global self-worth. Only scores falling below the 25th percentile rank should be interpreted confidently as low or negative (Marsh 1990). Graham's scores on the self-concept scales tend to indicate that he fosters a certain negativity towards himself. He seems to have serious doubts about his peer relationships and is questioning aspects of his physical appearance and general self.

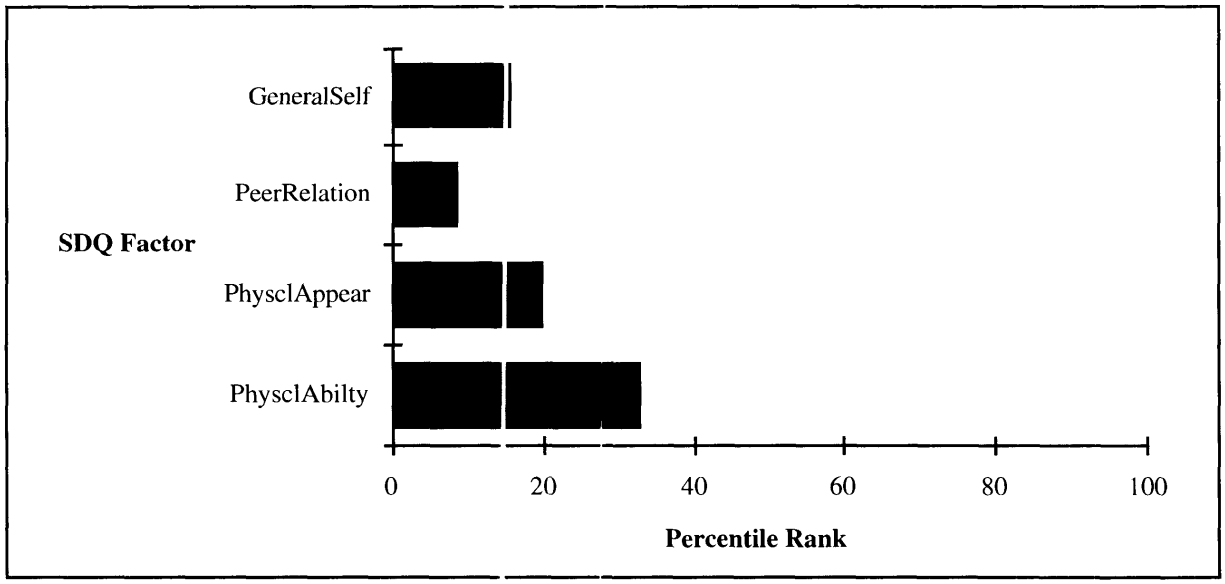

Figure 6.17 : Self-Description Questionnaire Factor Scores for Graham

This general area of assessment could be viewed as one that requires continual monitoring for Graham and one of minor concern at this time. The results of the SDQ for Graham, should be placed into perspective, as the youngest in the program, he should be viewed in conjunction with comments of parents and instructors, perhaps even more so than the older members of the group.

PERFORMANCE ON THE PROGRAM

Graham's attendance and participation in the Gymstart program was faultless. He attended every session and completed all of the homework tasks. The three sources of evaluation of Graham's performance during the program were: results on the pre and post test screening procedure; continual subjective assessment by program instructors which was documented in their final reports; and, parental information about progress during and since the program, derived from interviews.

Pre and post test

Graham's performance on the screening procedures was generally encouraging in that, for all items except one, he made steady improvement from pre to post tests. Figure 6.18 shows his scores on the items from each of the test trials. The pre-test screening determined also that Graham has cross dominance from eye to hand, i.e., he is right-handed and left-eyed.

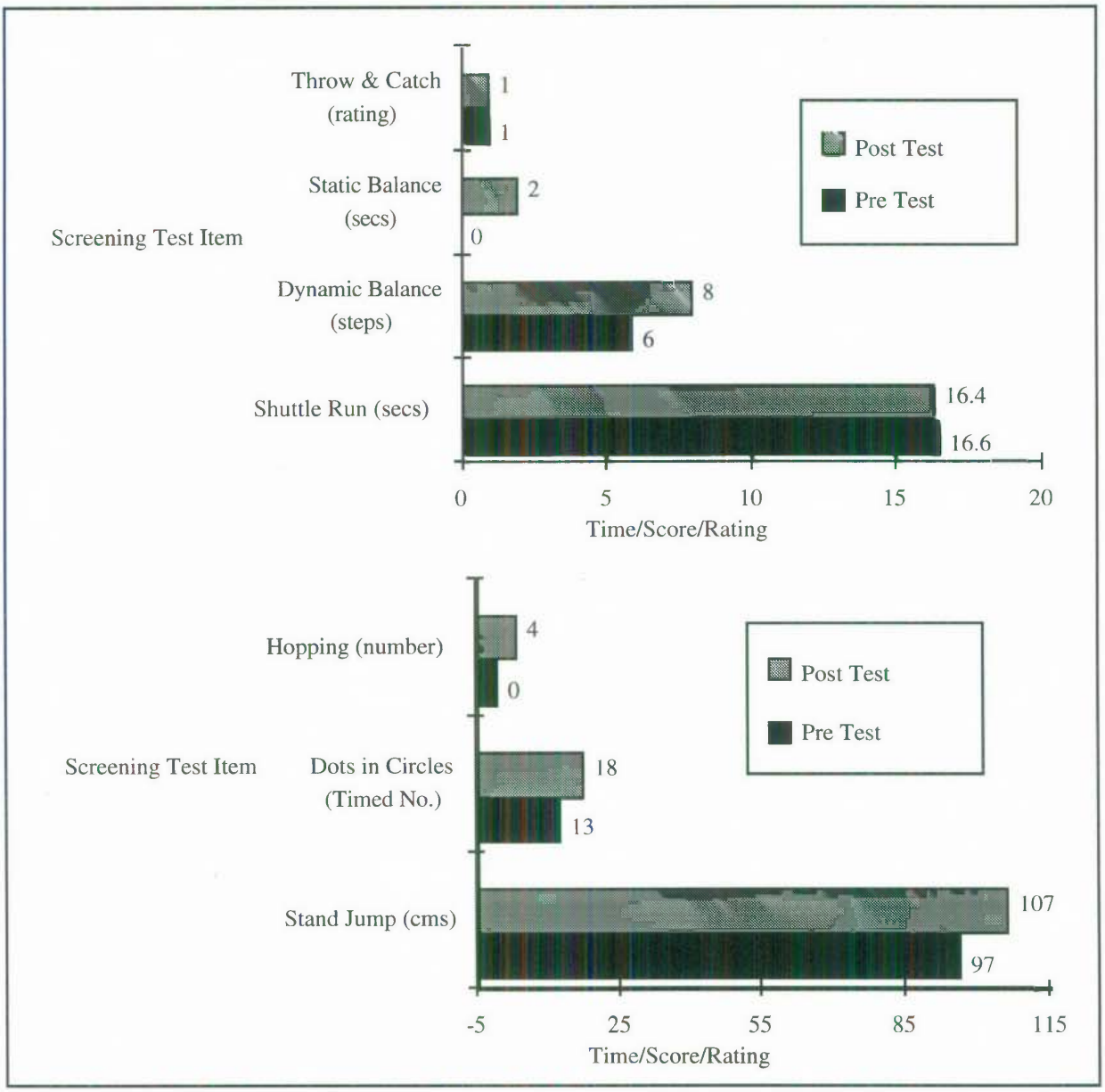

Figure 6.18 : Performance on Pre and Post Screening Tests - Graham

Closer analysis of the items reveals that for six items Graham improved his score from pre test to post test and stayed at the same level for the throw and catch task. However, although he made improvements across the board, in light of the relatively low baseline from which his successes can be compared, his achievements overall were not indicative of substantial improvement. There was only one test where it can be reasonably suggested that substantial improvement was made across the two trials, and that was on the standing jump where an improvement of 10 centimetres was recorded.

Comments from Instructors

Instructors comments regarding Graham's skill levels and development have been made previously. This sub-section summarises comments from the instructors regarding Graham's attitude, socialisation, motivation and any other relevant general comments not formerly reported.

> Graham has little confidence in himself and finds it difficult to perform gross motor tasks. The program has proved beneficial for Graham, he has improved in most aspects of movement skill. Graham is an exceptionally cooperative boy, exhibiting no behavioural problems. His attention to instructions was excellent, although he did lose concentration once set a task. Graham has a very good natured temperament, never getting annoyed or frustrated. He is a very shy boy but this did not stop him from participating, enjoying and interacting in group activities. Graham developed a close attachment to both instructors, liking to be near someone with whom he felt comfortable. Graham always gave a strong effort and was a delight to work with.

Graham thrived on the attention given by the instructors in terms of the social element of the program, although he lacked confidence in unfamiliar situations or with new personal contact. His cooperation in learning new skills was outstanding but not matched by improvements.

His Parents

Since the Gymstart program and moving to a new neighbourhood, which were coincidental, Graham is playing with other children more often. He now plays with balls, bats and other sporting equipment not previously of interest to him. Graham's parents have noticed that he is more motivated to participate and exhibits an increased level of confidence. They regard his skills to have improved and he has now become comparable to his peers, blending in with the group more often. This was evident at his first school sports carnival since the program, where he was, 'part of the pack, rather than being back at the end of all the slow coaches'.

Summary

There are signs that Graham improved his skill level slightly, as a result of participating in the Gymstart program. Anecdotal and subjective comments from a variety of sources, have

suggested an improvement in both his self-confidence and ability to mix with his peers in physical activity. Graham responded to instruction and showed some very positive attributes, which can enable improvement to continue. However, his progress has been slow, as his difficulties are limiting. Despite this the prognosis should be positive if remedial work continues.

IMPLICATIONS FOR THE RESEARCH FINDINGS

In many ways, Graham is typical of the study group as a whole. He exhibits characteristics reported as group trends in the last three chapters and, in terms of the descriptive analysis in Chapter 3, Graham could be said to possess attributes which characterised the Gymstart group as a whole. They are:

- Mechanical disadvantage in the proportions of limb segments;
- Fitness level is low;
- Lacking stamina, speed and strength;
- Neuromuscular ability level is low;
- Fine motor skills are generally lacking with even lower levels of gross motor function;
- High incidence of associated learning difficulties.
- Hereditary factor;
- Birth trauma;
- Willingness to participate and cooperate in remedial activities.

A comparison of this list of Graham's attributes, with the list compiled from Chapter 3, indicates identical characteristics to those of the group in nine of the fourteen attributes 'which may characterise the clumsy child' (page 87). Unlike the rest of the group, however, the attributes 'which may not characterise the clumsy child' (page 87), are evident in reverse for Graham's profile. They are:

- Family environment likely to have caused limitations to participation in physical activity;
- Incidence of referrals to other health professionals ;
- Self-concept being a detrimental factor to the movement inabilities;
- Cross dominance.

These characteristics are in opposition to the group characteristics, i.e., Graham exhibits the reverse of the attributes not characterising the clumsy child (listed in Chapter 3). This is the case in four out of four examples. However, this tends to reinforce the severity of Graham's condition, rather than be a real exception.

In the cluster analysis, Graham's results demonstrate trends which are indicative of the largest cluster group (n=9) in that as an individual he exhibited similar characteristics. The cluster analysis showed that children with mechanical disadvantages in body proportions and moderate to mild disability ratings on NDL, typified the characteristics of cluster 1 (see

Chapter 5) . Graham's scores for these parameters give a profile similar in many respects, with the severity of some of his difficulties seeing him pair-up first in the cluster analysis process and then join his eventual cluster group at about the half way point in the analysis. Graham's case serves to exemplify and exaggerate the characteristics of the clumsy child in both the severity of his dysfunction and the number of possible causes of his difficulties.

OVERVIEW

Graham's birth was traumatic, he required oxygen and there were associated labour difficulties. This history, together with signs of motor disability from the MAND test, may be indicative of some soft neurological damage. Graham's two siblings are significantly older and he had a fairly protected early childhood. His home environment and early childhood experiences, may have inadvertently caused movement deprivation. However, Graham was identified by the community health nurse, as exhibiting delays in developmental signs. There is a possibility also that some of his movement difficulties can be attributed to hereditary factors.

Graham is a short boy with appropriate height to weight proportions and slight aesthetic postural deficiencies. However, from these indicators alone, his body build and stature would not unduly disadvantage him in the performance of movement tasks. The two indices of limb proportions, may be a marked disadvantage for Graham in some movements. His low Crural Index and very low Brachial Index, indicate a disproportion in limb segment lengths likely to render Graham mechanically inefficient in some movements. Combined with this, Graham's level of fitness is generally below the average for his age. Whilst he has reasonable stamina and flexibility, i.e., while he is below average he could be considered in a normal healthy range, there is a marked lack of strength, speed and power. These aspects of Graham's fitness level would detract from efficient physical performance, although his fitness level is higher than most in the study group.

Graham's impaired neuromuscular ability would reduce his ability to control the efficient performance of any motor skill. In addition, this level of dysfunction can be detrimental, not only to the tasks of everyday living and participation in physical activity, but to any future endeavours which utilised manipulative skills. Assessment of his skill through video analysis and instructor observation, indicates difficulties with balance, locomotion and all aspects of general coordination. He responded to the remedial program in aspects of skill development but still has difficulty with most tasks. Since the program, he has been reported to have made some headway in achieving levels of skill acceptable in activities with his peers.

There are signs that Graham lacks confidence in himself and his abilities, e.g., the instructors and his parents have reported that he is very anxious in unfamiliar circumstances. Graham's

scores on the self-concept scales, tend to confirm that he fosters a lack of self-worth. Graham seems to have serious doubts about his relationships with peers and questions somewhat his physical appearance and general feelings of self. This area of assessment is one of concern at this time for Graham. If his difficulties continue, the situation could be exacerbated. Therefore, efforts should be made to build on small gains made in Graham's skill levels and to reinforce his confidence through other areas of success.

Graham responded positively to the Gymstart program in aspects of skill development but still has difficulty with most tasks. Graham improved his skill at a minimal level and showed an improvement in both his self-confidence and ability to mix with his peers, as a result of participating in the program. He reacted well to instruction and demonstrated certain attributes, which can enable improvement to continue. Graham's progress has been slow, due to his limitations. However, the prognosis can be determined in a positive direction if remedial work and access to physical activity continues.

CONCLUSIONS

In addressing previous research questions about the features of clumsiness, answered in part by chapters 3, 4 and 5, and the research question specific to this chapter, which asks:

(D) How do the identified features manifest themselves and affect the individual child with motor difficulties?

the answers derived from within single cases cannot be stated either briefly or simply, in the same way as answers to questions pertaining to group trends may be derived. Conversely, this chapter's question can only be answered by detailed descriptions of the case profiles which exemplifies group trends or describes atypical instances. However, in order to direct the focus more on to the stated question, this section summarises important facets of the three cases which address research question D.

A Brief Synopsis of the Profiles

At least one person in the families of Ann, Lance and Graham showed signs of clumsiness. In each case, either a parent reported being clumsy as a child or one of the siblings exhibits similar behaviours. All three children in the case studies experienced birth trauma, to some extent. Two of the children required oxygen as a result of this trauma and a third suffered difficulties from placental separation just prior to birth. Oxygen deprivation at birth has been linked to cerebral palsy and other developmental difficulties (Lifrak 1992). These factors, coupled with indicators of mild to severe motor disability from the MAND test results, may suggest some soft neurological damage. However, in the case of both Ann and Lance, other assessments of their motor development, would tend to dispel the likelihood of serious impairment to the nervous system. Both have achieved, at least socially, acceptable levels of

skill sufficient for participation with peers, while Graham still seems to be some way from this achievement

For all three children their home environment is stable, in terms of both parents being with the family, and there is an atmosphere of care and concern, generally supportive of the children's needs. However, in all three cases there is a history of some difficulties in the early childhood years which may well have influenced normal motor development. Graham may have suffered from movement deprivation due to a variety of factors limiting his opportunity for physical activity. He was identified by the community health nurse, as delayed in some of developmental indicators. Ann has spherocytosis, which has led to fairly major surgery at a young age. Apart from the disruption in the lead up to and convalescence from the surgery, this blood disorder is a limiting factor in some aspects of fitness capacity. Lance was slow to reach normal developmental milestones and some minor ailments. Although the variety and degree of circumstances across this very small sample is typical of the heterogeneity of clumsiness, the commonality is that there has been a limiting factor present during their early formative years.

Characteristics of body build, stature and proportionality in the cases examined, demonstrate both diversity and commonality in various factors. There is diversity in height, weight, levels of body fat and the proportionality indicators across the three children. However, the commonality exists in that each has a biomechanical disadvantage of one kind or another and all have a low brachial index. These features of physical capacity are typical of the study group as a whole. In particular, the proportionality profiles suggest some mechanical difficulty for movements involving limb segments.

A good deal of homogeneity was found in the fitness levels of the three children described in this chapter. The level of fitness in each case is characterised by levels of stamina, strength and power, which would be detrimental to efficient physical performance. Only the single parameter of flexibility showed any variety in measured capacity, with the range spanning low to high levels. These indicators mirror, to a large extent, those typical of the study group.

Graham, Ann and Lance have motor impairment levels of some concern. The main indicator used for overall neuromuscular development, the NDI shows: Graham being moderately disabled; Ann as moderately disabled; and Lance as mildly disabled. The three children have large discrepancies on MAND factors, ranging from : severe disability to normal in Graham's case; severe to mild disability in Lance's case; and mild to moderate disability for Ann. They have similar profiles on individual MAND tasks with scores spanning across a wide range. This range of scores, evident in all three, gives qualitative support for the lack of correlations across test items on the screening test which was reported in the findings of the supplementary study. Two of the children are cross dominant, this may contribute to

difficulty in writing and in some gross motor tasks. Albeit that evidence is scant and inconclusive on this issue, the incidence of cross dominance in the study group is similarly high. Although the MAND test results show difficulties with gross and fine motor tasks, two of the children had more difficulty in the gross motor area than in the fine motor area. These levels of motor impairment would decrease the capacity to plan and control for efficient performance of movement tasks and they are typical of the trends shown by the study group.

Once again, analysis of the children's performance through video and instructor observations, reveals similarities and differences. All three children had difficulties with balance and coordination involving ball skills. The extent of problems encountered and the combinations of coordination inabilities were diverse. While Ann and Lance only experienced difficulty in some aspects of coordination, Graham experienced difficulties across the board. All three responded well to the remedial program, in all aspects of skill development. High motivation and enthusiasm to learn, had elicited varying degrees of success. The gains made by Lance and Ann, to a certain extent, belie the MAND test results. These two children achieved levels of skill which can enable them to participate in most activities with their peers. This apparent anomaly of good progress made coupled with low scores on the test, exemplifies the lack of correlation across abilities shown in the Gymstart group. Whereas, although making gains, Graham's progress was less marked and exemplifies the difficulties children with more severe motor dysfunction experience.

Scores on the Self-Description Questionnaire should be interpreted with caution. Those scores lying between the 25th and 75th percentile can be considered normal, those above that range should not be interpreted diagnostically. Only scores below the 25th percentile can be interpreted as low in comparison with others, or showing deficits in that parameter (Marsh 1990). All three children have a different self-description profile of the four factors measured. Lance's scores on the SDQ can be considered normal and would not indicate negative effects, on or because of movement abilities. Ann's scores tend to indicate that she fosters a certain negativity towards herself. She seems to have doubts about her general self and her physical appearance. However, items that indicate her feelings about physical ability and relationships with her peers can be considered normal. Graham's scores indicate that he has serious doubts about his relationships with his peers and questions somewhat his physical appearance and general feelings of self. This area of assessment in this study is one that reveals little about the nature of the clumsy child.

In terms of other indicators of socialisation, two trends are apparent in all three children. Firstly, the children exhibited positive relationships with other children in the program. This indicates high levels of cooperation and personal attributes which endeared them to instructors. Secondly, all sources have reported a rise in the children's confidence during and

after participation in the program. In general, this inclination can be seen in the study group as a whole, although the second trend would have been reported more frequently.

Summary

In Chapter 5 the clustering of variables confirmed the findings of Chapter 3, that NDI, flexibility and brachial index are important indicators which characterise the clumsy child. This means that these three measures were prominent in describing the study group, the clustering of the variables, and the clustering the cases. This triangulation in analysing the data, points markedly to the importance of these indicators in addressing the research questions of this study. The case profiles in this chapter have illustrated the effects of these and other measures, to a greater or lesser extent, on the individual. In addition, the lack of ability to transfer skills is evident in individuals reported in this chapter, further reinforcing group findings in Chapter 4. The focus of the final chapter is on summarising the results identified in this and previous chapters, producing discussion, conclusions and recommendations.