

**THE GROSS MOTOR SKILLS IN CHILDREN WITH COMMUNICATION
DISORDERS BEFORE AND AFTER THE TRAINING PROGRAM**

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ABSTRACT

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The purpose of this study was to investigate the gross motor skill level of children with communication disorders. The main purpose was to evaluate the effect of the training program on gross motor skills with these children. The study was completed using the TGMD (Test of Gross Motor Development), which evaluates the gross motor functioning of children between 3 to 10 years of age. The gross motor skills in the TGMD are divided into two subtests: locomotor and object control.

Subjects (n=76) were all from special schools identified as having communication disorders. Of these children aged 6 to 10.6-years old (M=7.8 years, SD=1.3 years) 51 participated in the experimental group and 25 in the control group. The pre-test was completed in November-December 1994. The training program began in the beginning of the school year, in spring 1995 and it was conducted for 10 weeks three 45-minute sessions per week in the experimental group. It included three different exercise sessions: psychomotor training, ball skill training and body awareness training. The posttest was completed after the training program, in April-May 1995. The results were analysed by group, age and gender and they were compared to the normed data of the TGMD. Data was analyzed using t-tests, one-way anova, Levene test for homogeneity of variances and MANOVA.

The results indicated that the gross motor skill was low in children with communication disorders. Almost 70 % of the subjects had at least moderate motor difficulties. Difficulties existed especially in skills which demanded rhythm- and coordination skills, complicated neuromotor program or integration. In skip, for example, only one out of ten subjects passed all the performance criteria, while in run it was eight out of ten. In ball skills, which demanded quick ability to discriminate and sequence objects existed difficulties. The training program influenced especially the children's object control skills, in which the improvement was significant ($p < .05$). The training program improved children's visual-perception judgement and the confidence to control objects. The improvement in the locomotor skills was less than in the object control skills, even if in horizontal jump, leap and skip, which demanded integration and coordination, the improvement was remarkable. The findings between gender were quite similar. Only in skip and in overhand throw the differences were significant. After the training program girls improved more in the locomotor subtest and boys more in the object control subtest. The training program influenced the most the results of 8-year olds and the least results of 10-year old subjects.

Keywords: communication disorders, dysphasia, motor clumsiness, physical rehabilitation

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1 INTRODUCTION

During the last years the problems in communication and motor performance have become prevalent in children. It is supposed that the problems in communication may be caused by rush of a modern life, a few talkmoments with parents or the popularity of the videofilms and -games with children. The reduction of the physical exercise lessons in comprehensive schools and in leisure time can not maintain or increase the motor performance level with these children (Helin 1997). For this reason it is very important, that children participate in the physical exercise programs, which will develop the motor skills and create the opportunities for developing children's other skills, like linguistic and social skills (Holopainen 1986, 75-77; Sherborne 1990, 75-77).

Nowadays the budget savings are directed towards schools. In consequence children with special needs are often integrated for normal physical education lessons. Our interest towards special physical education began from this fact. We would like to help children with special needs by increasing their performance level in physical skills and interest towards sport. Children with communication disorders who have often associated motor problems have lately been discussed intensively in public. This increased our interest towards the content and the qualitative factors of the physical education lessons in comprehensive schools. In the future as physical education teachers we would like to know how much the motor performance level in children with communication disorders can be developed by the physical exercise and what kind of this exercise should be.

Children with communication disorders have problems in speech or understanding language. The problem, called dysphasia, is caused by a functional disorder or a damage to the linguistic part of the brain (Gröönroos 1995, 18). Although children with dysphasia are a heterogeneous group, the motor problems, which are relatively permanent are closely associated with it. According to Tervola-Laine (1987, 60-62) about 70% of the children in classes with dysphasia have mild motor problems. The low performance level in motor and academic skills may also have an effect on the children's other skills, like social skills. Therefore the purpose of this study is to clarify the level of gross motor skills in children

with communication disorders and the effects of the intensified training program on these skills. This study is a part of the larger project where the effects of the physical exercise programs on motor skills in children with motor problems are investigated.

2 DYSPHASIA

2.1 Defining dysphasia

The term ‘communication disorder’ is used for speech or a language disordered people. In this study it is concerned mainly for dysphasia.

Dysphasia is a unique language development disorder (gr. dys = disorder, phasia = speech). In fact, it is defined as an upper concept of problems existing in language development (Dysfasia 1995). It was first observed in the 1800’s. Interest began after Gallian (Wilson 1965) wrote in 1825 about childhood aphasia (Korhonen 1995, 17.) In 1853 William Wilde called dysphasic children “dumb but not deaf“ (Zangwill 1978, 45). It is now known that dysphasia is partial or total disorder in language and is caused by a functional disorder or a damage to the linguistic part of the brain (Albert, Goodglass, Helm, Rubens & Alexander 1981, 3).

Dysphasia is considered a problem in children over three years old. It causes difficulties in producing and/or understanding speech. Additionally, it is not possible to explain the presence of dysphasia by a hearing defect, the construction of speech organs, psychological disorder or environmental deprivation. (Gröönroos 1995, 18.) The intention of this definition is to exclude children with other developmental disorders from dysphasia. The term dysphasia is generally used in Finland, but term ‘specific developmental language disorder’ is also used to imply the same disability. The term dysphasia is used if we want to differentiate the truly learning disabled from the much larger group of people who have various learning problems. (Rapin, Allen & Dunn 1992, 112; Dunn 1997, 347; Gröönroos 1995, 16; Salovius 1991, 372-373).

The term dysphasia has two different meanings. First, it is defined as a “developmental language disorder” (DLD), and secondly, it is defined as an acquired, partial speech disorder. When previously learned speech or the whole process of linguistic ability is

disturbed the term aphasia is used. Aphasia is defined as a problem with understanding or producing speech. By using these two terms, the degree of the disorder in linguistic ability can be defined (a = total, dys= partly). (Haapanen 1997, 6-7; Korkman 1995, 120; Salovius 1991, 372-373; Sillanpää 1987, 153; Rapin et al. 1992, 111). The other synonyms used for the term dysphasia are: delayed linguistic development, abnormal linguistic development, specific language impairment (SLI) or learning disability (LD). (Haapanen 1997, 7; Korkman 1995, 120; Taipale, Mäki & Kivi 1987, 2)

Every year in Finland, 25-30 children are born with dysphasia, which is approximately 0,04 - 0,06% of the age group (Pakarinen 1995,7; Salovius 1991, 375). According to National Dysphasia Association, there are 4500 - 5000 children and adolescents with dysphasia in Finland (Dysfasia 1995). Dysphasia has found out to be more common in boys than girls (Rapin et al. 1992,113). According to Gröönroos (1995, 16) it is even four times more common in boys. Still, the number of children who have dysphasia is difficult to estimate because the criteria and an exact definition of dysphasia are unavailable. Since 1980, the number of children diagnosed having dysphasia has increased which may be caused by more precise assessments. (Haapanen 1997, 6-7; Hyytiäinen- Ruokokoski 1993, 5; Rapin et al. 1992, 112; Salovius 1991, 375).

2.2 Expression of dysphasia

Dysphasia is expressed through difficulties in understanding speech, writing, reading and expressing oneself. Expressive dysphasia is associated with problems in producing language, that is in conveying one's thoughts using verbal or written language. Receptive dysphasia is seen in difficulties in understanding spoken or written language, occurring as inability to comprehend information from text and speech. (Ahvenainen, Ikonen & Koro 1994, 74; Gröönroos 1995, 17; Rantala 1994, 7-8; Sillanpää 1987, 153.) In mild cases of dysphasia speech is clear, yet curt, and the individual sounds are replaced by some other sound. In more acute dysphasia the problem concerns the whole structure of language reflected by unintelligible and stammering speech (Vilkman & Martinen 1994, 4.)

2.2.1 Diagnosis

Dysphasia can be observed at the earliest at three years of age when the children's speech is indistinct. The real diagnosis can finally be made at school age when learning disabilities are noticed. However, a small delay in speech development may include to the children's normal development process. (Grönroos 1995, 4; Rantala 1994, 7.) According to Grönroos (1995) diagnosis is based on eliminating the possibility of having other impairments, especially a hearing impairment. In addition to auditory testing, the presence of other problems can be established by aptitude and neurological tests, and case history (American Psychiatric Association 1994, 57). Furthermore, the ability to concentrate, attention span, reciprocity and skills of speech comprehension are determined and gross, fine and visual motor coordination is evaluated (Rantala 1994, 7-8). One method of diagnosing dysphasia is to study the brain's EEG since dysphasia may be accompanied by EEG abnormalities or other abnormal findings and neurological signs. Differences in the EEG are seen if speech comprehension difficulties are remarkable. (Rapin & Wilson 1978, 33-34; Grönroos 1995, 18; Korkman 1995, 142.)

2.2.2 Features of language

The ways in which disturbances manifest themselves depend on the personal profiles of the impaired. Rapin et al. (1992, 122-123) have pointed out six different manifestations. 1) Dissociation of comprehension and production means severe delays in the onset of speech despite plentiful comprehension. Conversely, there are also children who speak better than they comprehend. They use phrases that mask comprehension deficiencies. 2) In discrepancy between lexical acquisition and intelligence, the production of children's speech is laborious even though they have adequate lexicons and know what they want to communicate, or conversely, speech is fluent, but largely unintelligible. 3) The dissociation of vocabulary and grammatical development means that vocabulary development is independent of grammar, so that the vocabulary size is not synchronous with the multi-word utterances, or that rules of grammatical construction may be in evidence, but the application of such rules may be faulty. 4) Discrepancy between vocabulary size and pragmatic means

that the children can have sophisticated vocabularies, but they are only able to use them for labelling purposes, rather than for communication with others. 5) Discrepancy between language ability and word retrieval can be seen in the excessive use of nonspecific forms, circumlocutions, to cover up difficulties in lexical retrieval. The children have more difficulty to formulating sentences than their overall language ability would predict. 6) Dissociation between processing of language and non-language sounds is a difficulty in the auditory processing of language despite normal hearing.

2.2.3 Features of behaviour

A consequence of a children's difficulty expressing themselves is abnormal behaviour. This can be seen as perseveration, egocentric behaviour and inability to think about abstract things. In everyday life children's behaviour is often hyperactive and anxious, or conversely, introvertive, which is seen as a difficulty to contact other people, even autistic behaviour. Weepiness and laughing can be signs of poor self-esteem or a method self preservation. (Grönroos 1995, 16-18; Salovius 1991, 377; Rapin & Wilson 1978, 16.) According to Sinkkonen (1993, 31), impulsiveness and anxiousness are caused by the heterogeneity of motor and perceptual development, which causes the body image to be imperfect. A deficiency in the area of sensory information processing is a typical feature for children with language disorders, therefore sense perception may lead to strange reactions. (American Psychiatric Association 1994, 59.) The most usual is overreacting to tactile sensation which causes hyperkinetic behaviour. On the other hand, there is also underreacting to pain, for example. Sensation of movement, especially gravitational changes produce overreaction, too. (Danner 1993, 101.) The children with dysphasia also have difficulties imaging different situations. It means that fairy tales or imaginary stories are almost totally disregarded, whereas visual presentations, such as cartoons, can be markedly interesting. Familiar stories whose events the children know and understand well, create a feeling of safety. (Grönroos 1995, 16-18; Salovius 1991, 377.)

2.2.4 Classification

The classifications of language disorders vary depending on one's standpoint. One of the newest classification systems has been created by Rapin & Allen (1989) in which they have grouped developmental dysphasia into six classes. The basis of these classes are properties of the children's expressive language, their ability to understand words and language, and their ability to maintain conversation. (Rapin et al. 1992, 124). This linguistic approach is based on phonologic, syntactic, semantic and pragmatic skills. (Korkman 1995, 130; Salovius 1991, 374.) This grouping can be used in doing prognoses of linguistic development and planning rehabilitation programs. The first class is phonologic-syntactic disorder, in which speech is fluent, although sentence structures are simple. While difficulties are seen in oralmotor skills, comprehension of language is better. Secondly, phonologic production disorder means that one has difficulties in self expression, but understanding is easier. The third, in verbal auditory agnosia, the children do not understand spoken language well, so most knowledge is gained visually from the environment. The typical features of this class are use of "an own language" and autistic behaviour. EEG differences are possible in this class. Fourth, production and reception of speech are difficult in verbal dyspraxia. There are also difficulties in repeating speech from a pattern which results in short and simple sentences. Fifth, the problems of lexical-syntactic deficiency are seen in the reproduction of words and difficulties in understanding abstract things and inflectional forms. Finally, semantic-pragmatic disorders appear in hyper verbal behaviour, although communication is poor and answers are illogical. (Hyytiäinen-Ruokokoski 1995, 11-13; Korkman 1995, 130-131; Rantala 1994, 8; Rapin et al. 1992, 124.)

According to American Psychiatric Association (1994), that has tried to simplify and standardize the classification system, the subtypes of children's language disorders are expressive language disorder, mixed expressive-receptive disorder and phonological disorder. (Korkman 1995, 135-136.) The individual with expressive language disorder has a limited amount of speech and vocabulary range. They also have difficulties in finding words. The other most important features of this subtype are vocabulary errors, shortened sentences, simplified grammatical structures, use of unusual word order, and slow rate of language development. Mixed receptive-expressive language disorder encompasses not only

the difficulties with expressive language disorder, but also difficulty in understanding words or sentences, or deficiencies in various areas of auditory processing. Pure receptive language disorder is never seen, because the development of expressive language relies on acquisition of receptive skills. Phonological disorder includes errors in phonological production that involve failure to form sounds correctly and deficiency in linguistic categorization of speech sounds. (American Psychiatric Association 1994, 55-61.)

2.3 Etiological factors of dysphasia

In the 18th century according to the heredity theory, unexplained learning difficulties mainly resulted from the weaknesses in heredity or brain structure (Ahvenainen & Karppi 1993, 59). After the mid 20th century children's linguistic problems were examined from the developmental point of view instead of the neurological point of view. (Cantwell & Baker 1987, 3). Despite the facts that dysphasia is a developmental problem, the causes may be unknown. The symptoms may vary according to age or can be influenced by the definition difficulties and children's individual differences. (Salovius 1991, 375.) Nowadays the slowness of the data collecting capacity is associated with dysphasia. The problem is the frequently variable sound signals which causes difficulties in processing the language that we hear, in other words, the hearing process. (Haapanen 1997, 9; Pakarinen 1995, 15.) Still, several researchers assume that dysphasia is either a disease which has the same background and reason, or a disorder which has many different reasons and backgrounds, even though the latest investigations support the brain origination background theory (Pakarinen 1995, 15). Nowadays the heredity, environmental and social factors are also taken into account when speaking about the etiological factors of dysphasia (Ahvenainen et al. 1994, 16; Pakarinen 1995, 15; Rapin et al. 1992, 116; Taipale et al. 1987, 11).

2.3.1 The neurological basis of dysphasia

The basic cause for dysphasia is considered to be organic or brain originated although the real structural or functional reasons can not be discovered (Grönroos 1995, 16). The brain originated theory of dysphasia is supported by recent studies of abnormal cell stratum areas

which have been discovered among cells from the thalamus, the middle part of the brain (Pakarinen 1995, 15.) In the linguistic part of the brain the damage or disorder may be caused by prenatal, perinatal or neonatal minor lesions or functional failures in the central nervous system (Haapanen 1997, 6; Hyytiäinen - Ruokokoski, 1995, 5; Salovius, 1991, 375). The predominance of boys with dysphasia may be caused by the slower maturation of the male central nervous system (Gröönroos 1995, 16). Additionally, Salovius (1991, 375) assumed that boys are more susceptible to be damage than girls during fetal development or delivery. Similar results found Geschwind and Galaburda who stated that brain of boys mature later and more slowly than those of girls because of testosterone retards maturation of the brain. (Rapin et al. 1992, 116).

According to the accepted old theory, abnormal lateralisation is one reason for the development of dysphasia. This can be confirmed by the different dimensions of the brain and abnormal or inverse symmetry studies. (Pakarinen 1995, 15.) Gröönroos (1995, 18) described left-handedness as a character of a mild brain damage or a disorder in the lateralisation of the brain's dimensions. The speech function of left-handed people is divided more eventually between the spheres of the brain than with right-handed people. Of right-handed people the production and understanding of speech is controlled by the left brain sphere as is reading, writing and apparently, counting. For left-handed people the right brain dimension participates in these functions mentioned before. These activities also appear in the right brain sphere of left handed people. (Holopainen 1986, 9; Palo 1994, 383; Taipale et al. 1987, 11.) Still, the causes for hand preferences are complex and multidimensional and it is not highly correlated to the hemispheric localization of speech. A systematic comparison between well defined dysphasic syndromes and others with acquired aphasic syndromes provided that localization of dysfunction in dysphasia remains to be determined. Even if it is enlightening, it has not been carried out. (Cratty 1994, 124-125; Rapin et al. 1992, 116).

2.3.2 Heredity, environmental and social factors

The heredity factors have their own effects on the abnormal linguistic ability or the chromosome modifications (Salovius 1991, 375). There is a claim that dysphasia is

hereditary although the detailed mechanism of inheritance can not be recognized. The delayed speech development and the different degrees of linguistic difficulties in the family are frequently connected to dysphasia. Furthermore, other developmental failures with same common factors and frequently appearing left-handedness can be reasons for dysphasia (Grönroos, 1995, 17). According Rapin et al. (1992, 116) a number of chromosome anomalies may be associated with speech and language disorders, even though it is not clear how often these are isolated defects.

In the early communicative development of the child, environmental and social factors have an important role. All the factors the child can see and hear activate him to use language, in other words to have interaction with the environment (Ahvenainen et al. 1994, 61; Haapanen 1997, 6). According to Fundudis et al. (1979) social factors, like employment patterns in the family cannot be discounted. Lindström and Nettelbladt indicated that there is a connection between the child's language disorder and the educational level of the mother (Nettelbladt 1983, 25-26).

3 DYSPHASIA AND MOTOR CLUMSINESS

Children with dysphasia are a heterogeneous group. In addition to linguistic problems other problems, like motor problems appear. It has been indicated that children with dysphasia perform poorer than their peers do in motor skills (Rintala & Palsio 1994, 37). Motor problems may affect on children's other skills too. Children may be more introverted and judge themselves less competent than their peers regarding physical and social skills (Miyahara 1994; Schoemaker & Kalverboer 1994).

Motor development is necessary prerequisite to language. Between language and motor development there is a strong correlation, although the degree of motor disability is not directly correlated with language. Motor training lead to language improvement, but also children's social relationships and self-concept. (Alahuhta 1990, 81; Lahey 1988, 120; Tervola - Laine 1987, 62.) In this chapter a relationship between motor clumsiness and children with dysphasia is observed, by describing certain features commonly associated with dysphasia and motor clumsiness, and by exploring the common etiological indicators.

3.1 Motor clumsiness

Children who have problems with tasks requiring good coordination are called clumsy children (Ahonen & Lyytinen 1991, 91; Sherrill 1993, 14; Wall 1982, 254). According to DSM- IV the mild abnormalities in motor development are diagnosed as "*the developmental coordination disorder*". Diagnosis is determined if the coordination disorders are not due to a general medical condition, like cerebral palsy, hemiplegia or muscular dystrophy (American Psychiatric Association 1994, 53-55). Clumsiness is considered a heterogeneous syndrome. It may appear in children 1) as an independent and isolated syndrome or 2) as a partial syndrome. If it is child's partial syndrome, the central syndrome may be for example linguistic. (Ahonen 1990, 6). In the literature children's movement difficulties are described with different terms: "*motor learning disability*" (Keogh, 1982, 237), "*physical clumsiness*"

and “*physical awkwardness*” (Wall 1982, 254). “*Developmental apraxia*” or “*dyspraxia*” is used for children who have always been inefficient with voluntary movements (Wall, Reid & Paton 1990, 285).

Childhood clumsiness exists in about 5 % of the children, depending on the constancy and the broadness of the lesion. More severe clumsiness which caused problems in locomotion exists with about 2 % of the children. (Ahonen & Lyytinen 1991, 92.) In classes with dysphasia children about 70% of the children have mild motor problems (Tervola-Laine 1987, 60-2.), while the analogous percentages in normal schools among children with excluded sensory, motor or emotional problems or learning difficulties are 10-15% (Sherrill 1993, 24). Like dysphasia, clumsiness is observed to be more general among males (Gordon and McKinaly 1980, 10). Still qualitative sex differences between clumsy girls and boys are not considered remarkable (Tervola-Laine 1987, 42). According to the study of Missiuna (1995, 227) clumsiness was even five times more common with males than females. However, the frequency is dependent on the available measurement and criterion, because clumsiness is not always measured or identified with identical methods. (Schoemaker 1992, 28). Alternatively, Cratty (1994, 5) has stated that gender differences may be due to a tendency to observe boys more often than girls. In many societies boys get more public pressure to excel physically and are observed more often by peers and teachers than girls are.

There are different opinions about the constancy of motor clumsiness. In the literature clumsiness is considered to be fairly continuing problem, although it may be improved with age. (Ahonen 1990, 31; Ahonen & Lyytinen 1991, 91; American Psychiatric Association 1994, 53- 55; Cratty 1994, 329-50; Missiuna 1994, 232; Sherrill 1993, 14, 266; Wall 1982, 254). According to the study of Ahonen (1990, 56), 74 % of the five-year old clumsy children selected for this study appeared to have problems at the age of eleven in at least one educational skill: reading, writing or mathematics. In this study the stable coordination problems from the children can be observed at the age of five (Ahonen 1990, 55-60). Cantell, Smyth & Ahonen (1994, 125) examined children age of 5 as having delayed motor development. According to them 46% of a group of clumsy children still differed from the control group in motor performance ten years later.

The long range effects of awkwardness has been investigated in a follow-up study of Knuckey and Gubbay (1983). In this study the awkward children who were significantly inferior to their controls in handwriting, sporting ability, popularity and academic performance, were assessed after eight year of the pre-test. The reassessment were done after the young adults were divided into three groups according to the degree of the awkwardness: mild, moderate and severe. The results indicated that severely awkward children were doing significantly less proficient than the controls. (Wall et al. 1990, 292.).

3.2 Etiological factors of motor clumsiness

Etiology of motor clumsiness is diverse and complicated. It describes the fact, that authors, during the past 60 years, have illustrated it with word "unclear" (Wall et al. 1990, 288.) Child's motor development is based on various interactive systems: development of perceptual and data processing skills, memory, control of attention and speed of data processing skills. Motor functioning is also connected to linguistic and metacognitive skills. If numerous of interacting physiological, psychological and sociological systems influences on motor performance, the separate investigation of motor clumsiness apart from the other development is difficult. (Ahonen 1990, 2- 3; Cratty 1994, 78-81.)

It is still unclear, if clumsiness and language difficulties have common indicators of a single underlying deficit or if their concurrence merely reflects involvement of neighbouring brain areas. Some researcher have made a conclusion that developmental dysfunction of the left hemisphere might lead to both language and motor impairment. (Powell and Bishop 1992, 755.) Motor defects in children with learning disability who have functional language impairment, identified as reading-disabled or dyslexic, are caused by poor motor planning rather than motor output. The level of motor performance declines when the demands (planning and cognitive) of motor tasks grow higher. Deficiencies in children with learning disability who have problems in coordination, balance, postural control and decreased muscle tone, are caused by same sort of neurological "soft signs". (Lazarus 1990, 241-242.)

Knuckey, Apsimon & Gubbay compared central nervous system between clumsy and normal children. According to this measurement 39 % of clumsy children and 9 % of children who belong to control group have noticeable anatomical abnormalities, like ventricular dilation, peripheral atrophy and parenchymal disruption. (Schoemaker 1992, 27). Still, the connection between these findings and clumsiness is unclear. Even the signs of clumsiness do not always correlate with signs of obvious brain damage, it will exclude the progressive neurological diseases from the diagnosis (Ahonen 1990, 6; Ahonen & Lyytinen 1991, 91; Ahonen 1995, 249; Cratty 1994, 22; Schoemaker 1992, 28). The other factors which may have a connection to the motor coordination difficulties are: genetic, risk factors during pregnancy, delivery or an early development of the child and social factors, like unprotected environment (Ahonen 1990, 121-122; Cratty 1994, 255; Gallahue 1982, 64). Lack of confidence and negative affect towards physical activity may affect on sport participation, which may reinforce the tendency to dislike situations requiring motor competence. Often difficulties in motor performance appear to add additional challenges and problems to children with other learning problems: like low peer status. Not surprisingly, children who have movement problems do not enjoy physical activity or competition (Lazarus 1990, 287-295.)

3.3 Perceptual-motor skill

Motor act can be understood as a perceptual-motor skill, because movements are based on information about your environment, your position or location within it. (Haywood 1993, 204, 281-282.) Perception is a recognition and interpretation of stimuli received by the brain from the sense organs in the form of nerve impulses. Motor response to this interpretation is perceptual-motor. (Dunn 1997, 40-41.) The development of perceptual-cognitive system influences on motor development. Perceptual motor activities require cognitive ability, as they include both an individual's interpretation and a response to sensory stimulation. On the other hand, perceptual-motor activity does not involve meaning, interpretation or cortical-level functioning, because sensory motor activity occurs at a subcortical level. Perception is one aspect of sensory integration. (Winnick 1995, 273.)

Dunn (1997, 351) has divided the deficiencies experienced in motor performance with learning disabled children for six different classes: 1) nonspecific awkwardness or clumsiness, 2) problems of laterality or directionality 3) generalized inadequacy of perceptual-motor function, 4) poorly developed body awareness, 5) poorly developed kinesthesia and 6) fine motor incoordination. In this chapter the deficiencies experienced in children with dysphasia are described from three different viewpoint: 1) from sensory perception, 2) from body awareness, and 3) from visual perception.

3.3.1 Sensory perception deficiencies

While producing and conducting motor movements, separate organisms are functioning together, even if they are responsible of different tasks. (Ahonen 1990, 3; Ahonen 1995, 252; Cratty 1994, 78). The "*speechless*" part of the cerebrum controls mainly sports and locomotion. This part, which is with right-handed people the right part of the brain will quickly adapt the information from the sense organ to the visual and space memory and develop the movement pictures. (Ahonen, Lahtinen, Sandstöm, Pogliani & Wirhed 1993, 61.)

Often children with delayed language are unable to formulate quickly appropriate plans to attempt reasonably complex motor tasks. These complex tasks with remittent movements are difficult, because they have to use one or several parts of the body. (Cratty 1994, 104, Schoemaker 1992, 25-26; Sherrill 1993, 276). Children may also be unable to integrate different body parts when complex tasks require a complicated neuromotor program. Like in jumping forward skill, where the arms and legs must work in unison, the use of upper limbs may be impossible. (Pennanen & Rantakokko 1994, 47). In throwing, difficulties exists when children step appropriately and shift weight from one foot to the other. Integration problems may also be associated with poor motor planning, the apraxic behaviour (Cratty 1980, 36, 404; Cratty 1994, 140.)

Laterality, defined the internal awareness of the two sides of the body has developed in early childhood. Well developed laterality is considered for success in reading and writing too, when left-to-right progressions across the page must be sustained. (Dunn & Fait 1989, 327; Dunn 1997, 352.) Qualitative difference between the body parts may exist in skill-specific or in general manner: In running one or the other shoulder leading, moving or jumping laterally with one leg in front of the other. (Missiuna 1994; Wall 1990, 290.) One reason for functional asymmetries in movement may be caused poorly functioning hemisphere. (Cratty 1994, 127.) Especially in movements required coordinating series of movement laterality is needed, like in rhythmic galloping, skipping or in riding bike. Galloping requires less integration, because the child have to keep one foot in front of the other all the times, while moving forward in a shuffling manner (Cratty 1980, 400.). Maintaining rhythm while riding bike is difficult, because a child has to transfer a program from one side to another, but also maintain balance at the same time. For this reason, in primary and secondary education such developmental methods should be developed, which use functions of the both brain hemispheres. Especially important for children with dysphasia is, that functions located to the right side of the brain is used. (Taipale *et al.* 1987, 12.)

Some children who have delayed language may have problems connected to the memory deficiencies. Children with developmental language disorder have been associated deficiencies in short-term verbal memory (STM). (Rapin *et al.* 1992, 126). If the capacity of STM is filled, the individual will find it exceedingly difficult to solve a problem that requires some conscious resources. For example, highly automatic walking skill requires a small amount of conscious STM resources to avoid stumbling into objects. (Ceci & Leichtman 1992, 224).

3.3.2 Deficiencies in body awareness

Children's learning begins with gravity and the body (Ayres 1983, 46.) Only two years old children learn new movements through position - and movement senses, in other words, through proprioception. The proprioception gives us information caused by contraction and stretching of muscles and by bending, straightening, pulling and compression of the joints

between bones. (Ahonen *et al.* 1993, 62.) The body schema contained information about awareness of movements and environment, conception of one's own performance and emotional experiences connected to these. The preferable a persons' body schema is, the better he controls his movements. A lack of body awareness may appear in different ways with various sensory modifications (Ayres 1983, 115-116).

In schools children with reading and writing problems are observed to have more often difficulties in motor directionality than the control group has. (Alahuhta 1990, 81). During the front roll a child may be unable to use his arms while his head is placed down and in throwing, child may keep his throwing arm in front of the body to be aware of his arm's location. In forward jump the use of arms may be ineffectual or not accurate. These defects are often referred in poor formation of the body schema, body concept and body image. (Cratty 1980, 402; Cratty 1994, 215, 222.)

Children with linguistic problems have often difficulties in identifying different parts of the body or understanding different concepts (Korkman 1995, 133.) Difficulties exist in tasks demanding eye-limb coordination, in dressing up, tying shoelaces, buttoning up a shirt or cutting with scissors. In schools the difficulties occur with games and play or in writing and handwork (Schoemaker 1992, 25-6; Sherrill 1993, 276; Wall *et al.* 1990, 280; Winnick 1995, 276). These problems may arise from sensory-perceptual problems in attempting to locate their body in space. It may also be caused by tactile defects that exist in the limbs and in the fingers or kinesthetic defects of limb location. The tendons and joints of kinesthetic receptors offer information about the location and movement of limbs and provide important contributions to accurate motor control (Cratty 1994, 201).

3.3.3 Deficiencies in visual perception

Visual motor coordination is not an exclusive visual ability. It is the ability to coordinate vision with body movements. (Winnick 1995, 276.) Visual perception has an essential significance to a child's movement behaviour, especially while executing complicated motor tasks. The visual process has an important role also when a child processes a printed word

into spoken language (Gallahue 1982, 318; Cratty 1994, 203-205). Faulty visual discrimination may be due to defects existing in one or more of the following areas: visual discrimination, figure ground discrimination, depth perception, object constancy and object identification. (Dunn 1997, 351). The fundamental aspects, like vestibular, proprioceptive and tactile functions promote the visual processes, like space and form perception (Ayres 1983, 115-116).

According to Tallal *et al.* (1981) some children with language-disorders have difficulties in discriminating and sequencing of rapidly visually or auditorily presented stimuli (Rapin *et al.* 1992, 125; Powell & Bishop 1992). Often visual-perception judgements become worse when objects are moving faster or when target speed is increased. (Cratty 1994, 208). To get a clear picture of the environment, the brain must be able to direct the eyes in following the movements of objects and people (Ayres 1983, 116.) In the study of Tervola-Laine (1987, 55-62) children with dysphasia attained the weakest results in dynamic balance skills and the strongest in ball skills. The correlation between ball skills and linguistic ability was highest and linguistic skill explained 25% of the motor performance. In ball skills demanding hand - eye coordination, 63% of children with linguistic problems have difficulties in throwing and 69% in catching the ball (Pennanen & Rantakokko 1994, 47). Especially tasks completed with one hand are difficult for clumsy children. Least difficulties with dysphasia children emerged in coordination tasks completed with two hands. (Kalverboer, Hopkins & Geutze 1993, 203; Pennanen & Rantakokko 1994, 64.)

According to Taipale *et al.* (1987,19) children with dysphasia are observed to have impairment in visuo-spatial perception. Pennanen & Rantakokko (1994, 46) found that children aged from 7 to 12 with linguistic difficulties had disturbances in motor skills, like in ball skills, manual dexterity and controlling static balance. In this same study 47 % of these children had problems in controlling balance in walking. Vision and balance are closely aligned both behaviourally and neurologically (Cratty 1994, 206). Children with language disorders are observed to have problems especially in tasks demanding static balance (Rintala and Palsio 1994). Motor clumsiness can thereby, be explained by the external motor variables, like visuospatial or kinesthetic perception actions (Ahonen 1990, 92).

3.4 Conclusion

As previous studies have indicated, children with dysphasia have problems in motor function caused by different reasons. The basic reason for these motor problems is considered to be sensory. However, a lot of difficulties may originate from different reasons, like from visual, tactile or kinesthetic deficiencies. Even there are a lot of problems, which may also be permanent, it does not indicate that motor skills could not be developed by physical exercise. Separate skills, for example hand-eye coordination, can be improved by physical exercise programme. (Tervola-Laine 1987, 36; Palsio 1993, 49.) For this reason, children with dysphasia require a versatile rehabilitation methods which are based on different senses.

4 THEORIES OF PHYSICAL REHABILITATION

There are many theories of physical rehabilitation existing. The term physical rehabilitation has been chosen to mean all physical training methods which are used in rehabilitation and that can also be used as training for children without disabilities. The most popular theories of today's physical rehabilitation are presented: perceptual-motor theories, Sherborne's method, psychomotorical training which are some of the strongest trends today.

4.1 Perceptual-motor theories

To the present over forty perceptual motor theories together with programs of rehabilitation have been proposed (Dunn 1997, 355). Their value is emphasised differently according to who is investigating them. According to Schoemaker (1992, 103), the best-known programs are Kephart's (1973) perceptual motor training, Ayres' (1972) "Sensory Integrative Therapy", "The Frostig-Horne" -program and sensomotor training which Mesker (1979) and Van Empel (1980) have designed. According to Dunn (1997, 355) the best known perceptual-motor programs have been developed by Barsch, Cratty, Frostig, Getman and Kephart. In spite of these Myers & Hammill (1990, 374) maintain that the biggest names in perceptual-motor programs are currently Cratty, Delacato, Ayres and Getman. In fact, the programs of Kephart, Barsch and Frostig had the greatest influence during the years 1950 - 1970, but today they have only historical value. (Appendix 1.)

Perceptual-motor theories have been grouped in many ways. Polatajko, Macnab, Anstett, Malloy-Miller, Murphy & Noh (1995) have grouped them in an approach that Laszlo and Bairstow (1985) named task-oriented approach; and sensory integrative approach. Gallahue (1982, 309-310) has divided programs in three classes: *concept developing*, *concept reinforcing* and *remedial programs*. Concept developing programs are designed for children who for a variety of reason have been limited in their experiential background. The program of Frostig (1969), for example, belongs to this class, in which a variety of multisensory

experiences are used for developing fundamental readiness skills. In concept reinforcing -programs activity is used with traditional classroom techniques to develop basic cognitive understanding. Activities are a vehicle for reinforcing cognitive concepts. These programs have been developed by Cratty (1973) and Humprey (1974). The third class is remedial programs whose aim is to alleviate perceptual inadequacies and increase academic achievement. Delacato (1959), Getman (1952) and Kephart (1971) have outlined these programs for children.

Perceptual motor theories have been the most prominent in the field of learning disabilities, despite the variety of theories, assessment methods and differences between programs. (Myers & Hammill 1990, 373). According to Hallahan and Cruickshank, perceptual-motor training was the most popular method of physical education between 1936 and 1970. It was supposed to develop academic abilities and improve reading skills and cognition, even though this theory has been criticized. (Sherrill 1993, 231.) Programs were developed to provide training in the motor bases of behaviour, perceptual skills and training in visual, auditory and kinesthetic perception (Dunn 1997, 355).

4.1.1 Goal

The goal of perceptual-motor training is to help the child mature motorically by teaching general skills and abilities, and gain social acceptance and self-esteem through these learned skills (Gallahue 1982, 309; Kephart 1966, 159). Teaching the skills was not used at first, rather the purpose was to help children to function better physically, academically and emotionally by having the children control their own actions and initiate an activity achieve stimulations (Ayres 1979, 139-140). Today activities are seen as a part of normal developmental sequence for gaining motor level and playing skills. The advanced state of activity further the behaviour and working ability. (Danner 1993, 102-103; Dunn 1997, 357; Sherrill 1993, 320.)

4.1.2 Content

Exercising of motor skills is based on individual-environment interactions in which the sensing of movements is an important part of motor learning. The central purpose of rehabilitation is to stimulate sensations that produce some response. Functionality infers the ability to register adequate sensory stimulations, because motor reactions are dependent upon them (Danner 1993, 102-103). Motor capacity is improved by using exercises in which powerful and varied sensory information is experienced. This teaches the child how to move (Schoemaker 1992, 111.) According to Ayres (1983, 107-112, 271) sensory input should be provided from the vestibular system, muscles, joints and skin in such a way that the child spontaneously forms the adaptive responses which integrate those sensations. Using kinesthetic, visual and auditory senses environment, space and form perseveration are improved. (Dunn 1997, 355; Sherrill 1993, 306-307.)

Perceptual-motor training includes training in the motor bases such as balance in different positions and the development of directionality and laterality. Eye-hand coordination exercises have an important role in training, as well the self-controlling work, too. Other activities that are used focus on visual and auditory sense, body awareness, identity of body parts and figure-ground phenomenon. The program activities vary depending on age, skill level and type of learning disability. (Dunn 1997, 358-62; Sherrill 1986, 312-314.) According to Kephart it is better to start teaching under the skill level of the children in order to avoid frustration. The children's motivation grows, when they think of ideas themselves, which also develops their nervous system more than the guidance of the teacher. (Danner 1993, 102-103.)

4.2 Sherborne's developmental movement method

Children's body awareness begins to develop immediately after birth, when parents rock and hold the baby in their arms. The child is a passive receiver who is provided a knowledge of his body's existence by using sensory stimulants. Good body and spatial awareness develops self confidence in one's own body and capabilities within the environment, and also

enhances self-image (Richards 1996, 2a). Gaining a feeling for the body as a whole is more important for children than concentrating different movements of the body. Sherborne's method focuses on developing personal physical control and awareness, and interpersonal skills through interaction with others (Sherborne Foundation 1996, 2). When the child's language skills are underdeveloped, the interaction *via* movement works as a kind of communication, so that the child sends and receives different signals to and from his own body. (Sherborne 1990, 3-4, 37-41, 114-115.)

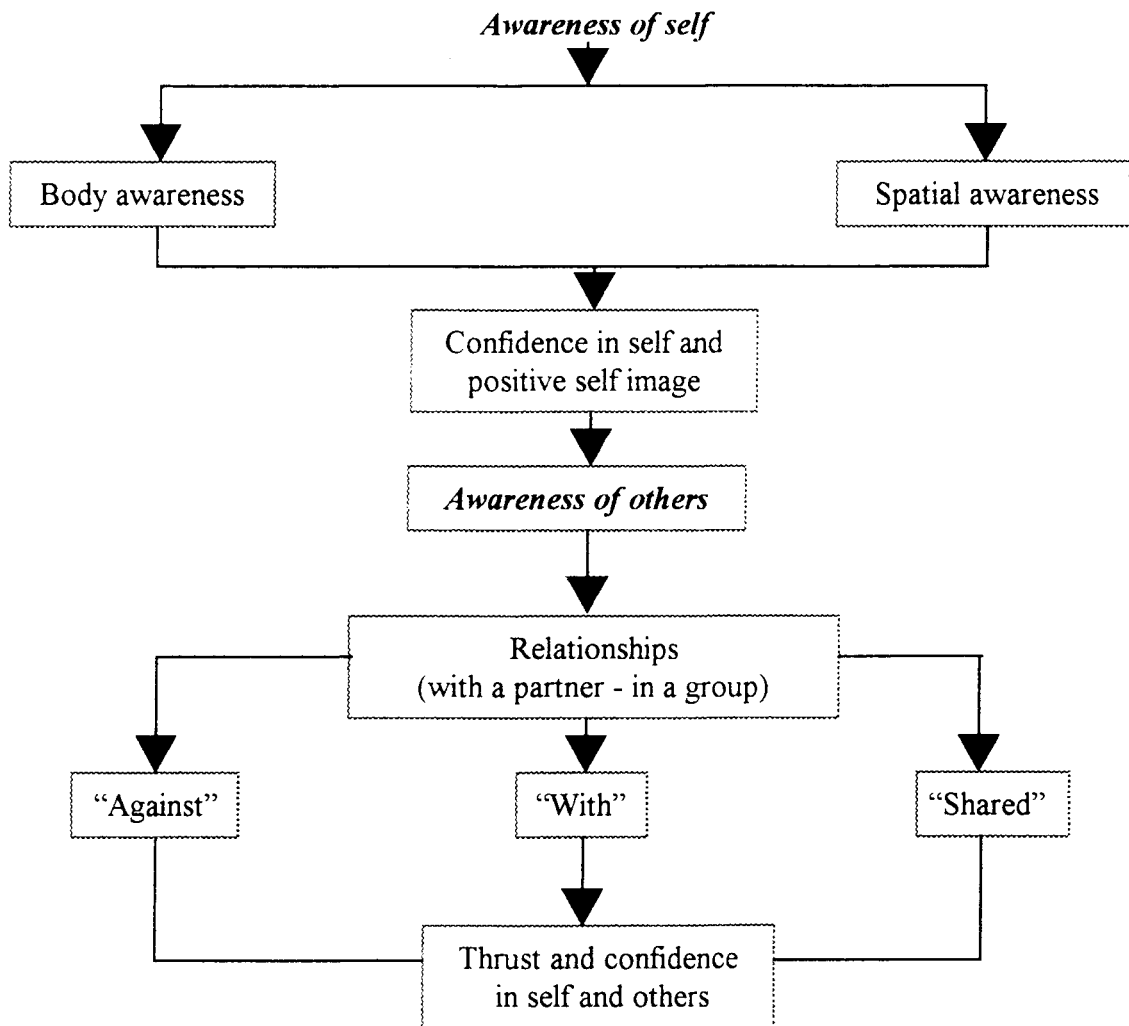
4.2.1 Goal

The basic purposes of Sherborne's method are to gain awareness of self and awareness of others (Sherborne Foundation 1996, 8). These are carried out by supporting the children's overall development ie. physical and psychological development. The aim of the physical aspect is to develop skills in building relationships with others and to master one's own body. The meaning of psychological aspect is to develop persons self confidence and self-esteem. These are the reasons that training is merely providing experiences and positive feelings. (Sherborne 1990, 111; Sherborne 1990, 387.)

4.2.2 Content

Training is based on developing skills, to master the body and mastering interactions with another person. The method used is called "Partnerwork". Partnerwork can be classified into three headings: *caring* or "*with*" *relationships*, *shared relationships* and "*against*" *relationships*. Caring or "*with*" activities include partnerships in which one partner both holds and supports another. Floor based activities using gravity create awareness of the body and how the trunk is a connection between extremities. Shared relationships teach how to support each other and at the same time how to trust each other with one's weight. "Against" relationships consist of movement in which partners test each others strength and stability. The principle is not winning, just testing. For this reason "against" relationships are more demanding than "with" relationships and shared relationships. (Sherborne 1990, 387-389.) A

session begins with simple caring activities and contains some elements of body awareness, spatial awareness and work on relationships every time. The session starts with individual activities and endings with an activity that involves the whole group. It is also important that there are different types of activities concerning movement quality in order to develop movement vocabulary. The most important thing is that movement sessions are shared experiences and they are enjoyable. (Sherborne Foundation 1996, 17-18.)



(Sherborne Foundation 1996, 8).

FIGURE 1. The basic principles of developmental movement based on Sherborne's method

4.3 Psychomotor training or motology

The human being is a psychophysical completeness whose mental life is connected with bodily function. That was Kiphard's, the father of psychomotor, view of physical education in the sixties. According to him, the mission of physical education is to raise self-esteem and self-confidence of children and also to create new experiences and to stimulate growth of personality. This is afforded opportunities for governing oneself, an object and some social situation. This is accomplished when the level of physical education is in harmony with the child's developmental stage and it is voluntary, thus being a source of pleasure. In psychomotor training the movement manifests the individual's personality also being part of the processes of perceiving and experience.

Motology is the science of movement that is grounded in training and developing methods of psychomotor training. Motology has developed *via* psychomotor; it is based on the thought of movement as a equipment for improving children's overall development. The human being is seen as a whole, whom actions are based on perceiving, investigating, sensing, feeling, thinking and motor functioning in a social environment. Through the motor learning process movement is the starting point of action and communication as a result of personality growth. Motology studies the connection between motor coordination, personality and environment, consequently the science is based on psychology, pedagogy and medicine. (Kiphard 1994, 12-14; Merviö 1996, 40-41; Passolt 1992, 29-31.)

4.3.1 Goal

The goal of motology is to develop the different parts of personality such as social, cognitive, emotional and motor. Movement situations teach to children how to manage themselves, surrounding material and social environment. (Merviö 1996, 42.) The purpose of such exercises are to perceive one's surroundings by using the senses and movement. Motology attempts to offer positive and individual experiences, because motivation and positive attitudes are preconditions for getting results. (Koljonen 1995, 11).

4.3.2 Content

The training hour begins with conversation as a whole group, which is followed by action-paced running play. During exercise the equipment plays a central role. The equipment is used very unconventionally forgetting its normal use. Creativeness and initiative are developed by looking for new solutions to problems. Relaxation and conversation finish the training hour. Sensomotor exercises are used much as a training device because they encourage functioning and create perception and movement experiences at the same time. There is no obligation to take part in exercises, because a positive experience is the goal. Children also think up ideas of themselves, which raises motivation. The training program includes psychomotor course exercises, controlled free movements and sociomotor free movements which are implemented on functional, physical, social and educational level. (Kiphard 1994, 49-54, Koljonen 1995, 11-2; Merviö 1996, 42-4.)

5.4 A summary of physical rehabilitation theories

In all the training programs, the senses are an essential part. The primary goal in perceptual-motor training is to develop children *via* their senses. When the first aim has been reached, it is followed by the secondary aim, which is to develop self esteem and social acceptance. Analogously Sherborne sees the mission of physical exercises a bit broader: it is awareness of self and awareness of others. This includes physical and psychological development, development of the whole person. Children's feelings are also noticed, since they create good self-esteem. In motology the children are seen as a whole, too.

Perceptual-motor training includes almost exclusive by sensory exercises, attempting to improve perseveration of movement, form, space and environment. Sherborne sees as central points body and spatial awareness, so that exercises are based also on body mastery and controlling activities with a partner; mainly on partner work. Sensory exercises are often used in motology also. In motology and perceptual-motor the children's own ideas are incorporated into the training, but for different reasons: motology tries to develop the

children's motivation while the goal of perceptual-motor training is to develop the nervous system.

In conclusion, the central point in perceptual-motor training is learning general skills, through which behaviour and work ability are improved upon. In Sherborne's method both the psychological and physical aspects are equally important. Motology stresses the human being's completeness even more than Sherborne, because the aim of motology is the personality growth.

5 EFFECTIVENESS OF PHYSICAL REHALIBITATION PROGRAMS

There are many intervention studies in which perceptual-motor training has been used. Especially the techniques of Ayres, Delacato, Kephart and Frostig have been investigated. Myers & Hammill (1990, 439, 448) have investigated more than 200 studies which concern the effects of training. As a consequence of their review, they recommend that the effects of perceptual-motor training should be carefully reevaluated, because this kind of training has not been successful. The programs can be harmful since they may waste valuable time and money, and may provide a placebo program while the child's problem requires a real remedial effort. Kavale and Mattson (1983) drew the same conclusion when they reported findings of meta-analysis that includes 180 studies assessing the efficiency of perceptual-motor training. They concluded that it is not effective in improving academic, cognitive or perceptual-motor variables. Furthermore, it should be questioned as a feasible intervention technique. (Kavale & Mattson 1983, 165.)

Miyahara (1996) has also done a meta-analysis of intervention studies on children with developmental coordination disorder. The statistics used were the findings of four previous studies. Miyahara concluded that research found no support for the efficiency of any specific intervention approach and that greater precision and specificity of theory and method are required in intervention research.

Rintala & Palsio (1994) have also compared different training programs. They studied the motor skill level of children with developmental learning disorders and tested the effect of three different training programs on these skills. The subjects (22 elementary special school children) were divided into three groups and tested in the non-randomized control group pre test - post test design. Each group received different training twice weekly for ten weeks. The training programs used were psychomotor training, body image training and the control group followed the regular physical education program. The subjects were tested by using the Test of Motor Impairment (TOMI). Clear motor problems were found in 82% of these children. Results also showed improvement which were 54% in psychomotor training group,

26% in the body image training group and 41% in the regular physical education group. Rintala & Palsio (1994) concluded that the motor skills of children with developmental learning disorders can be improved to a degree by intensified training programs.

Koivuniemi-Luoma-Aho & Tynninen (1996, 161-171) have documented an experimentation in Normaalkoulu (Normal Primary School) in Savonlinna, Finland, proposing to discover a theoretical key to reading and writing difficulties. The aim was to provide experiences in physical education as a means of preventing difficulties and possibility to lower the barrier to learning to read and subtraction problems. Furthermore, they attempted to clarify the possibilities of using physical education as a tool in the holistic development of children. All of the subjects (eight pupils of the first and second grades) had difficulties in reading and writing abilities, and half of them had concentration problems. The subjects were tested in pre- and post test by using a skill track. The experimentation was carried out in ten one-half hour programs. Psychomotor exercises were used as a main training program, along with Ayres' sensory integration therapy. Ayres' therapy advocates perceptual-motor trend which include sense and body image exercises, rhythm and music exercises, improvisation and creative exercises, and self-control exercises. The experimentation pointed out as the pupils' results improved, they developed responsibility and listening skills. They concluded that these kinds of activities have positive influences in preventing reading and writing problems.

6 RESEARCH PROBLEMS

The purpose of this study was to investigate the gross motor skill level of children with communication disorders in locomotor and object control skills. The main purpose was to evaluate the effects of the 10-week training program on gross motor skills of children with communication disorders.

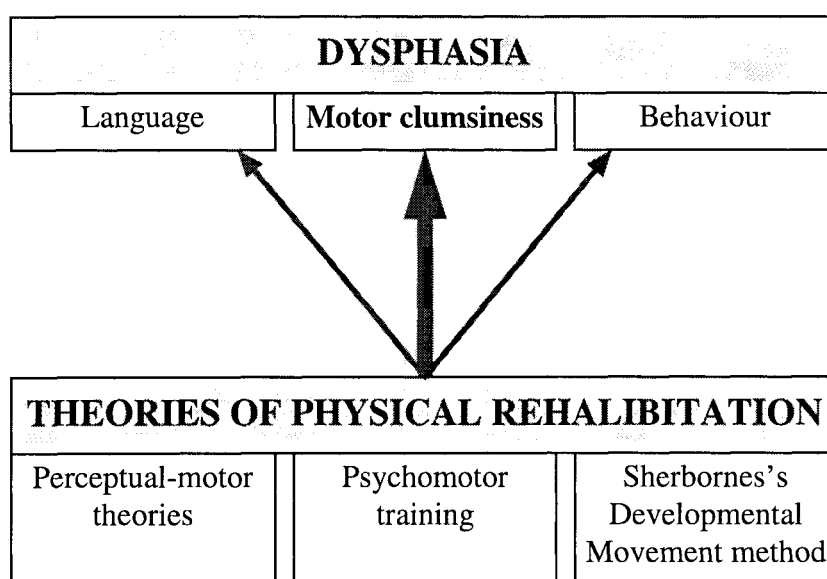


FIGURE 2. The framework of the study

The following research questions were addressed in this study:

1. What is the level of gross motor skills in children with communication disorders?
 - 1.1 Do they differ by gender ?
2. What is the effect of the intensified training program on gross motor skills ?
 - 2.1 Do the effects vary by gender ?
 - 2.2 Do the effects vary by children's gross motor skill level at different age level?

7 METHODS

7.1 Subjects

The study was conducted with 91 children identified as having communication disorders. Afterwards 15 subjects were eliminated from the final sample ($n=76$), because of the missing values or intelligence quotient under 70. The subjects were from three special schools and two special kindergartens for children with communication disorders, in Lahti, Tampere and Jyväskylä. The sample consisted of children who were between 6 to 10.6 years (mean age=7.8 years, $SD=1.3$ years). Of these children 51 participated in the experimental groups (14 female, 37 male) and 25 in the control groups (5 female, 20 male). Subjects were placed in special schools primarily due to language deficits, although other disabilities, like epilepsy, MBD or low intelligence quotient appeared. In this study most of the children (86%) were diagnosed as having an expressive language disorder or mixed receptive-expressive disorder of dysphasia. The other subjects (14 %) were diagnosed along to other disability, like MBD, autism or "other reasons". The mean intelligence quotient of the subjects was 92.9 ($SD=12.3$) and it varied from 70 to 122 according to Raven.

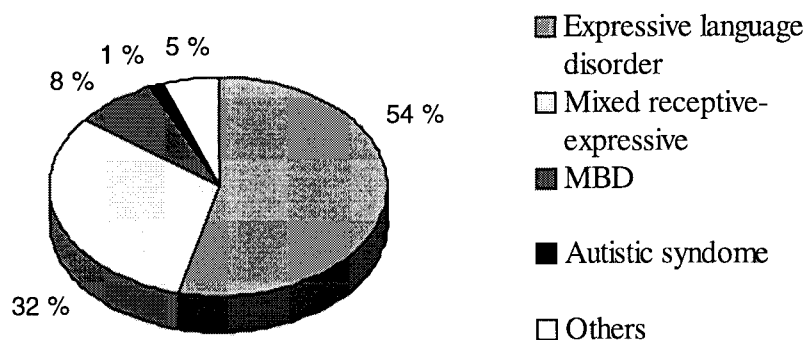


FIGURE 3. The diagnosis of the subject

7.2 Measuring instrument

The study was completed using *the Test of Gross Motor Development (TGMD)* (Ulrich 1985). It is an individually administered test that evaluates the gross motor functioning of children between three to ten years of age in preschool and early elementary grades including special education. The test will identify children whose gross motor development is significantly below their peers. In this study it is used for assessing gross motor skill level and the intervention effects of the subjects.

The test measures 12 gross motor skills which are frequently taught to children in preschool and early elementary grades. Motor skills are grouped into two subtests: locomotor and object control. The locomotor subtest measures the skills where the center of the gravity have to move from one point to another. It includes tasks of run, gallop, hop, leap, horizontal jump, skip and slide. The object control subtest measures the skills that project and receive objects. It includes tasks of two-hand strike, stationary bounce, catch, kick and overhand throw.

Each task is divided into three or four performance criteria. The performance criteria is marked, if the subject performed two out of three trials correctly (Appendix 2). The maximum raw score for the locomotor subtest is 26 and for the object control subtest 19. Raw scores from different subtests are not comparable for different age classes. Standard scores are most useful for making comparisons. The maximum in locomotor and object control skills for the standard scores is 20. The maximum sum of total (object control and locomotor subtest) standard scores is 38. This can be expressed by an other type of standard scores, the gross motor development quotient, the mean of which is 100 and a standard deviation of 15. The scores of the gross motor development quotient can be derived for seven different categories. These different categories describe the level of the children in gross motor skills. (Table 1.) The percentiles addressed the level of children compared to the norms of the TGMD manual. For example in average level, 25-75 % children belonged to this group according to the TGMD manual. (Appendix 3.)

TABLE 1. Test scores and their interpretation

SUBTEST STANDARD SCORES	SUM OF STANDARD SCORES	GROSS MOTOR DEVELOPMENT QUOTIENTS	DESCRIPTION	PERCENTILES
17 - 20	31 - 38	131 - 165	Very superior	> 99
15 - 16	27 - 30	121 - 130	Superior	95 - 98
13 - 14	24 - 26	111 - 120	Above Average	84 - 91
8 - 12	17 - 23	90 - 110	Average	25 - 75
6 - 7	14 - 16	80 - 89	Below Average	9 - 16
4 - 5	10 - 13	70 - 79	Poor	2 - 5
1 - 3	2 - 9	35 - 69	Very Poor	< 1

7.3 The intensified training program and its implementation

The intensified training program for the experimental group included three different exercise sessions per week: *psychomotor training* (Kiphard, 1994), *ball skill training* (Gallahue 1994) and *body awareness training* (Sherborne, 1990). Each training was completed as a 45-minute training session and it was instructed by the teachers of physical education and the teacher of special education. Children in the control groups followed the regular physical education lessons in special schools. The lessons included basic fundamental locomotor skills which were performed through games and sport activities according to the curriculum.

The purpose of the psychomotor training was to develop the mastery of the own body and static and dynamic balance. The training consisted of 11 circuit training stations, which children experimented 2-3 times. Stations were 1) varied walking and running, 2) climbing the ladder, 3) trampoline jumping, 4) rhythmic jumping on the floor, 5) rope jumping, 6) dynamic balance walking, 7) target throwing, kicking and batting, 8) jumping over and crawling under the bar, 9) static balancing, 10) somersaulting, and 11) rolling on floor. The aim of the ball skill training was to develop object control skills. It consisted of tasks performed individually, in pairs, and as a group ending with a lead-up game. The basic aims of the *body awareness training* were to develop awareness 'of my physical self', an emotional and physical security, an increase in confidence, different ways of communication, being and feeling creative, and awareness of the environment. Training

was based on the Sherborne Developmental Movement method (Sherborne, 1990). (Appendix 4.)

The pre-test was completed in the November-December of 1994. The intensified training program began in the beginning of the school year, in spring 1995. It was conducted for 10 weeks, altogether 30 hours, in the experimental group. The posttest was completed after the intensified training program ended, in April-May of 1995.

7.4 Data analysis

The comparison between the means of the experimental and control groups were done by one sample t-test and by t-test for independent samples. Percentages were used, to describe the frequencies of the subjects in each skill. The change in motor performance (from pre- to posttest) was tested between the experimental and control groups through time with the multivariate analyses of variance (MANOVA). At different skill level the influence of the training program was analyzed with one-way anova. As the subjects were normally distributed in an interval scale and the variances were equal according to Levene test for homogeneity of variances the test could be used.

The gross motor skill level of children with communication disorders was compared to the norms of the TGMD manual. The comparison was based on the standard scores and the gross motor development quotients. The statistically significant differences are expressed as follows:

$p < .05$ = almost significant (*)

$p < .01$ = significant (**)

$p < .001$ = very significant (***).

7.5 Reliability

Reliability indicates the random error of the measurement: the instrument should measure what it was intended to. Reliability indicates also the validity of the instrument. If the test is not reliable, it can not be considered valid. (Thomas & Nelson 1990, 317-343.) Reliability can be measured by stability. Stability of the TGMD has been evaluated for generalizability coefficients, which were calculated for locomotor skills (.96) and for object control skills (.97). The internal consistency reflects the homogeneity of the items within the test. It provides information on the extent to which each item measures the same function. The coefficients was calculated by using Spearman-Brown formula. For locomotor subtest it was .85 and for object control subtest .78. (Ulrich 1985, 27-29.)

Linjala (1997, 50) has investigated suitability of the TGDM for Finnish children. The pre-test intraclass correlation between two observed times was .96 in locomotor skills and .95 in object control skills. The equivalent intraclass correlation in posttest were .95 and .91. In this study the two different observers analysed the posttest results. The correlation was measured between these two observers. In the gross motor skills it was .84. In locomotor subtest the correlation was higher (.85) than in object control subtest (.82). All these correlations were satisfactory. In the test situation all the measuring equipment and environment were familiar to the observers. The identical methods (explanation, order e.t.c) were used for all subjects by different observers

7.6 Validity

Studies are concerned with both internal and external validity. Internal validity controls the extend to which the results of a study can be attributed to the treatments used in the study. If internal validity is not sufficient, the results have no interpretation value. The external validity describes the ability to generalize the results to other subjects and other settings. (Kari & Huttunen 1981, 66-72; Thomas & Nelson 1990, 317-343.) In this study the standardized TGMD instrument was used. The test measures the gross motor skills between children 3-10 years of age. The content validity of the TGMD has been

established good, because of representative sample (n=999). (Ulrich 1985, 30.) The construct validity refers the degree to which a test score measures an underlying theoretical construct or trait. Construct of interest in the TGMD is fundamental motor development. It has been investigated and discovered good. (Ulrich 1985, 30.)

This study was quasi-experimental. The subjects were from three special schools located around Finland. It can be assumed that the results are comparable for the other children with communication disorders. However, a lot of unexpected adventures may affect on the results. In this study these adventures were controlled as followed: The time between the pre- and posttest measurements was 5 months and the different observers were used in these measurements. In this study the both groups followed the physical education lessons in the special school. It was not presumable that the physical education lessons developed the skills considerably. There were 15 eliminated subjects, which did not change the size of the groups considerable. In the test situation the circumstances were same for all of the subjects and the observers took care that they did not feel unpleasant by encouraging them. Even the unexpected adventures were controlled carefully, it should pay attention to the fact that the children with communication disorders are a heterogeneous group.

8 RESULTS

In the first chapter (8.1) the level of gross motor skills in children with communication disorders will be presented. The interpretation is based on the performance level in locomotor and in object control skills. The gross motor performance level in pre-test was examined by age groups and gender. The next chapter (8.2) will describe the effect of the intensified training program on gross motor skills. It has been analyzed through time by the experimental and control groups. The influence of the training program for the gross motor skills are also examined by gender and at different age level.

8.1 The level of gross motor skills in children with communication disorders

The level of gross motor skills are examined in locomotor and object control skills. The performance level in different skills have been described percentually. The level of gross motor skills in different age groups were analyzed by comparing the means of standard scores using one sample t-tests.

8.1.1 The level of locomotor skills

The performance level of the subjects in the locomotor skills has been described in seven different tasks: run, gallop, hop, leap, horizontal jump, skip and slide. The classification is based on the two different performance level: 1) all the criteria completed 2) none of the criteria completed (zero scores). Figure 4. illustrates the frequencies percentually.

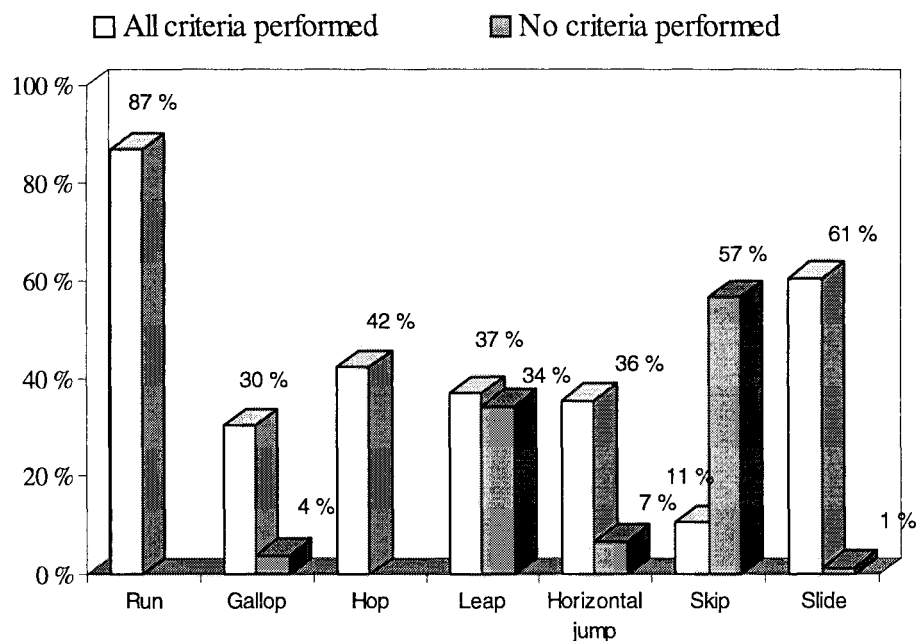


FIGURE 4. The performance level of the subjects in locomotor skills

Figure 4 demonstrates that 87% of the subjects completed all the performance criteria in run. In slide it was 61% and in hop 42%. Difficulties appeared especially in skip and leap, where 57% and 34% of the subjects did not complete any criteria. In run and in hop all of the subjects completed at least one of the performance criteria. It can be seen that the performance level of the subjects in locomotor skills vary a lot depending on the task.

The gross motor performance level in the locomotor skills by age group was investigated by comparing the means of standard scores (Figure 5). By using the standard scores the different age levels were comparative. The results were compared to the TGMD manual. It indicated that none of the age groups reached the average level. The level of 8-year old subjects were lower (*poor*) than the performance level (*below average*) in other age groups. (The performance level is marked with bold and cursive font in the description column).

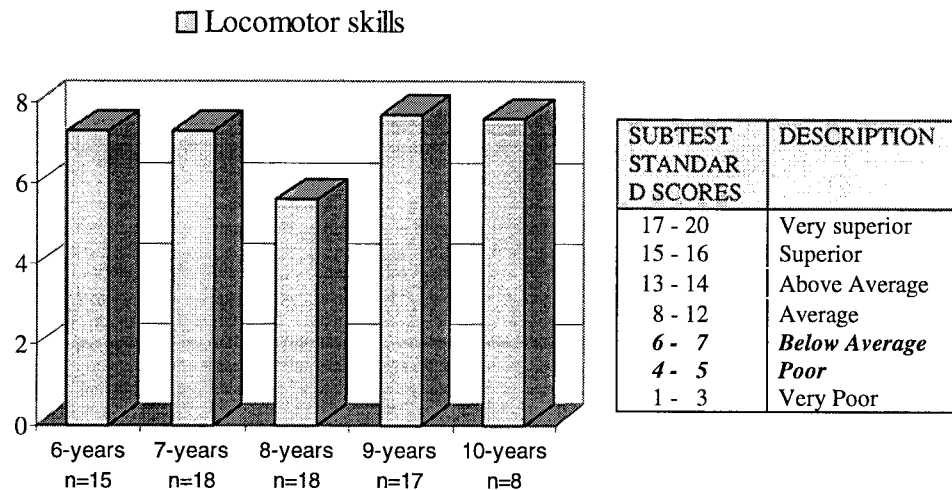


FIGURE 5. The performance level in the locomotor skills by different age groups

8.1.2 The level of object control skills

The performance level of the subjects in the object control skills is described in five different tasks: two-hand strike, stationary bounce, catch, kick and overhand throw. The classification is based on the same two performance level than in previous chapter (8.1.1). Figure 6 illustrates the frequencies percentually.

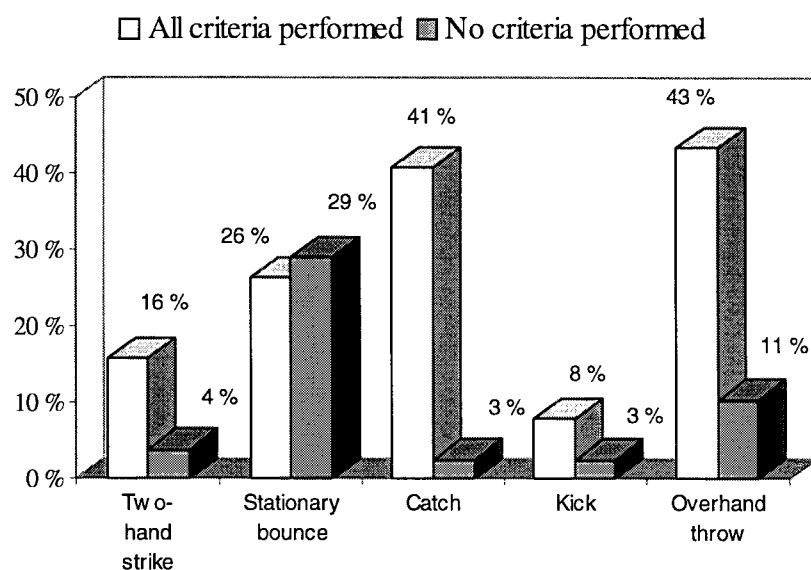


FIGURE 6. The performance level of the subjects in object control skills

Figure 6 demonstrates that in overhand throw 43% of the subjects completed all the criteria. In catch 41% and in stationary bounce 26% of the subjects did perfectly. Even if stationary bounce task was easy for many, 29% of the subjects did not complete any criteria. In overhand throw 11% had difficulties. It can be concluded that perfectly completed performances did not occur as much in object control skills than in locomotor skills.

The gross motor performance level in object control skills was investigated by comparing the means of the standard scores (Figure 7). By using the standard scores the different age levels were comparative. The results indicated that only the 6-year olds reached the average level. The level of 10-year olds were lower (*poor*) than the performance level in other age groups (*below average*). The performance level in object control skills was more heterogenic in different age groups if compared to locomotor skills.

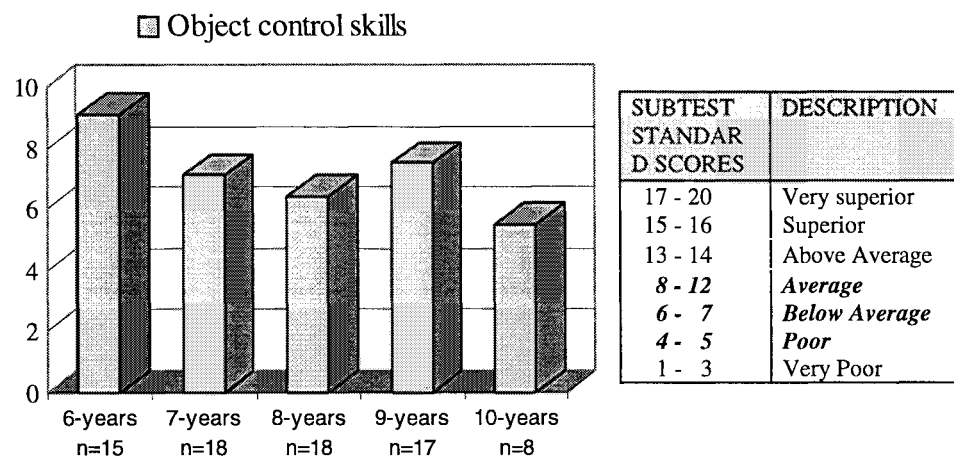


FIGURE 7. The performance level in object control skills by different age groups

8.1.3 The level of gross motor skills

The results indicated that level of gross motor skills in the children with communication disorders was low. About 66 % of the subjects had gross motor skills below average and only 1 % had skills above average compared to the TGMD. The performance level in gross motor skills between age groups was investigated by comparing the means of standard scores. Figure 8 indicated that the level of the subjects in all of the groups were below average. In the group of 8-year olds the performance level was lowest. This group belonged to the level of *poor*, while the others belonged to level of *below average*.

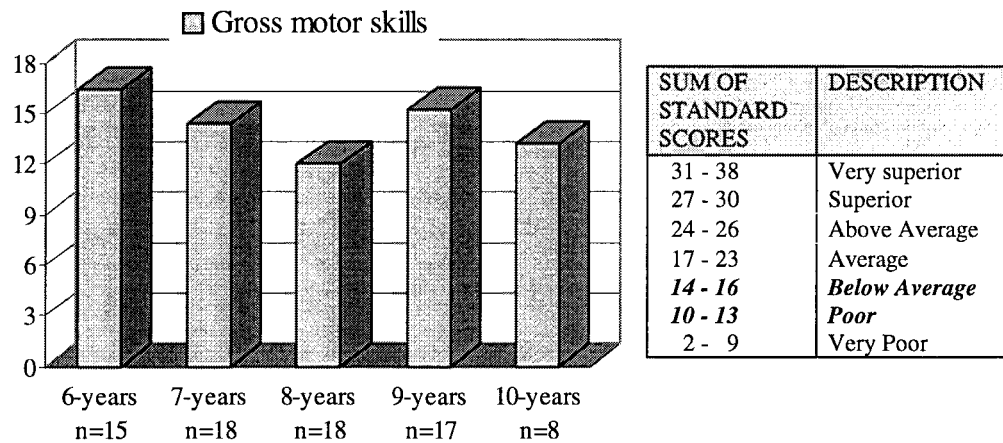


FIGURE 8. The performance level in gross motor skills by age

8.1.4 The level of gross motor skills by gender

The performance level between gender in the locomotor skills was investigated by t-test for independent sample (Figure 9.) The findings indicated that only in skip the difference was very significant ($p<.001$), i.e. girls performed better than boys. Otherwise the results with males and females were similar.

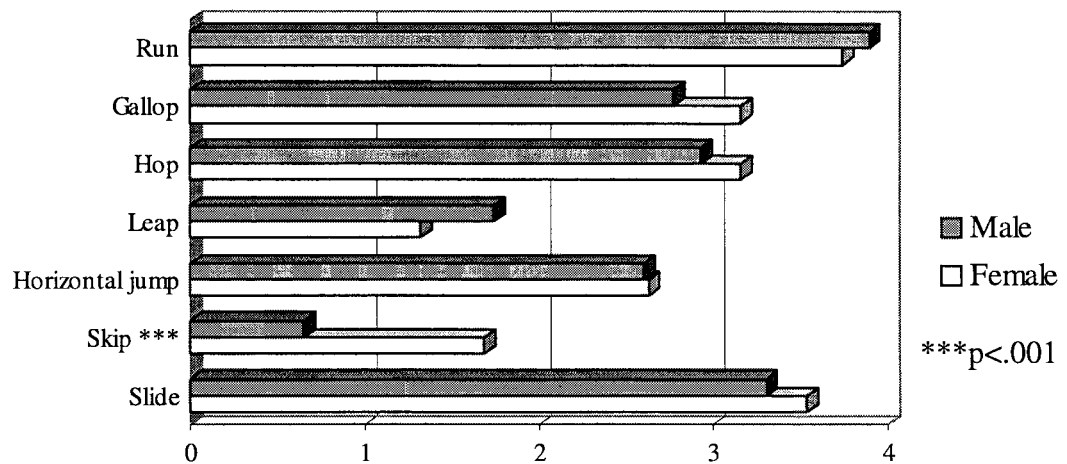


FIGURE 9. The performance level in locomotor skills by gender

The performance level in object control skills between gender was investigated by t-test for independent samples (Figure 10.). The results indicated that males were better in all other skills, except in kick. Only in overhand throw the difference was significant ($p<.01$).

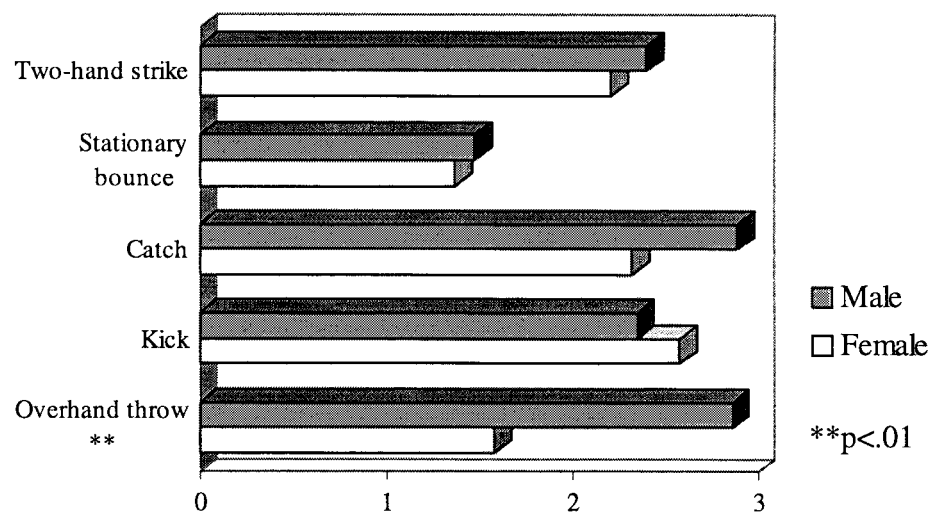


FIGURE 10. The performance level in object control skills by gender

It can be noticed that females performed better in locomotor skills and male better in object control skills. However, the total scores in gross motor skills were similar between males and females.

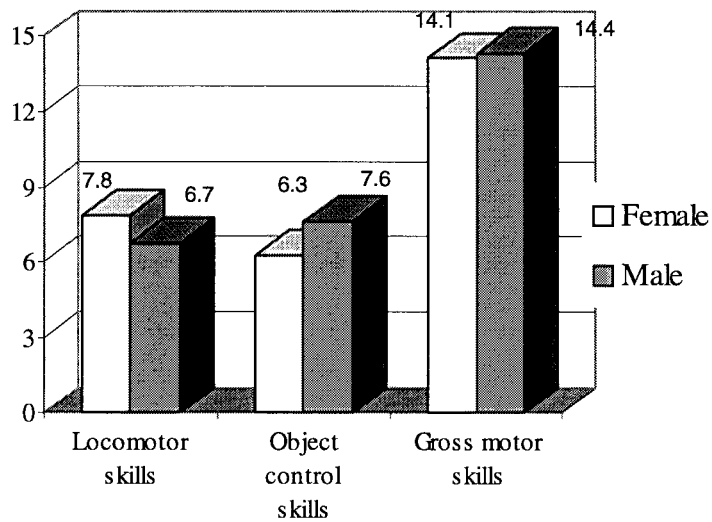


FIGURE 11. The gross motor skills by gender

8.2 The effect of the intensified training program on gross motor skills

The effect of the training program in gross motor skills was examined with the multivariate analysis of variances (MANOVA). The change (from pre- to posttest) were investigated in the experimental and control groups through time. The separate skills were investigated by t-test for paired samples. The effect of the training program on gross motor skills at different age levels was investigated with one-way anova.

8.2.1 The effect of the training program on locomotor skills

The change in locomotor skills in the experimental and control groups through time was examined with MANOVA (Table 2). The MANOVA results indicated that the change between the groups through time was not significant in the locomotor skills, $F(1,74)=.10$, $p=.754$). The change between the pre- and posttests results were similar in both of the groups. Even the experimental group took part in the training the development was not as clear as expected. However, between the groups there were differences by measurement, $F(1,74)=5.24$, $p=.025$. This indicated that even the development of the groups were similar through time, the posttest result of the experimental group was better compared to the results of the control group.

TABLE 2. The change in locomotor skills in the experimental and control groups through time

Source of variation	SS	df	MS	F	Significant of F
Within + residual	214.26	74	2.90		
Measurement	15.17	1	15.17	5.24	.025
Group by time	.29	1	.29	.10	.754

The effect of the training program on separate locomotor skills was investigated by t-test for paired samples. The development from the pre- to posttest is described percentually in figure 12. The results indicated that the improvement was positive in all skills, except in

gallop, where the results were stable. The improvement was very significant ($p<.001$) in horizontal jump, significant ($p<.01$) in leap and almost significant ($p<.05$) in skip.

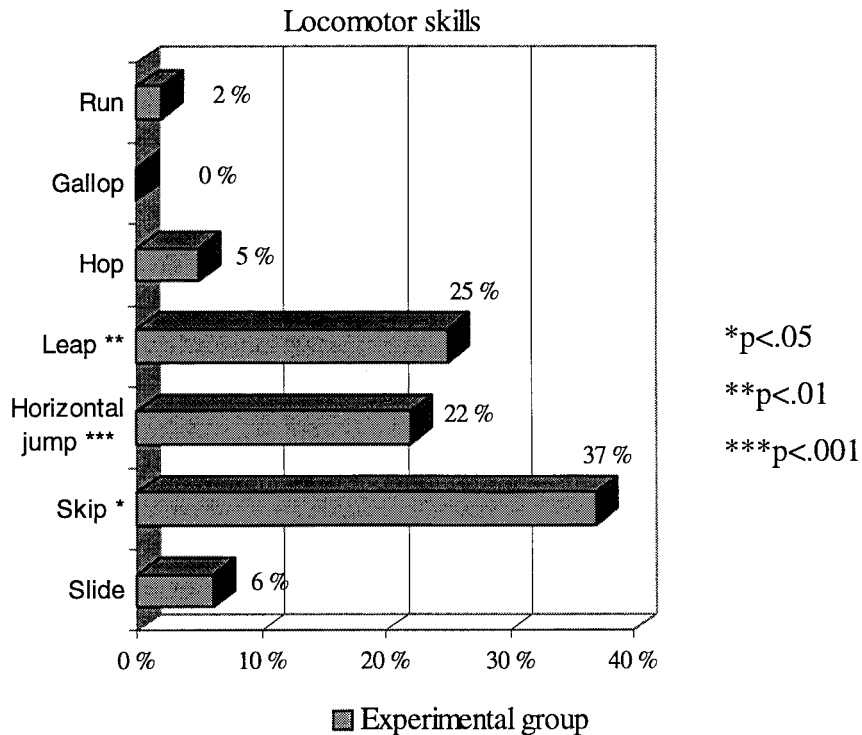


FIGURE 12. The effect of the training program on locomotor skills

8.2.2 The effect of the training program on object control skills

The change in object control skills in the experimental and control groups through time was examined with MANOVA (Table 3). The MANOVA results indicated that the change between the groups through time was significant in the object control skills, $F(1,74)=5.79$, $p=.019$. The experimental group had clearly better posttest results than the control group had. As there were differences between the results through time, the differences between the measurements was not necessary to interpret.

TABLE 3. The change in object control skills in the experimental and control groups through time

Source of variation	SS	df	MS	F	Significant of F
Within + residual	167.22	74	2.26		
Measurement	6.62	1	6.62	2.93	.091
Group by time	13.08	1	13.08	5.79	.019

The effect of the training program on separate object control skills was investigated by t-test for paired samples. The effects are described percentually in figure 13. It can be noticed that the development was positive in all the other skills, except in kick, where it was negative. In two-hand strike, catch and overhand throw the improvement was very significant ($p < .001$).

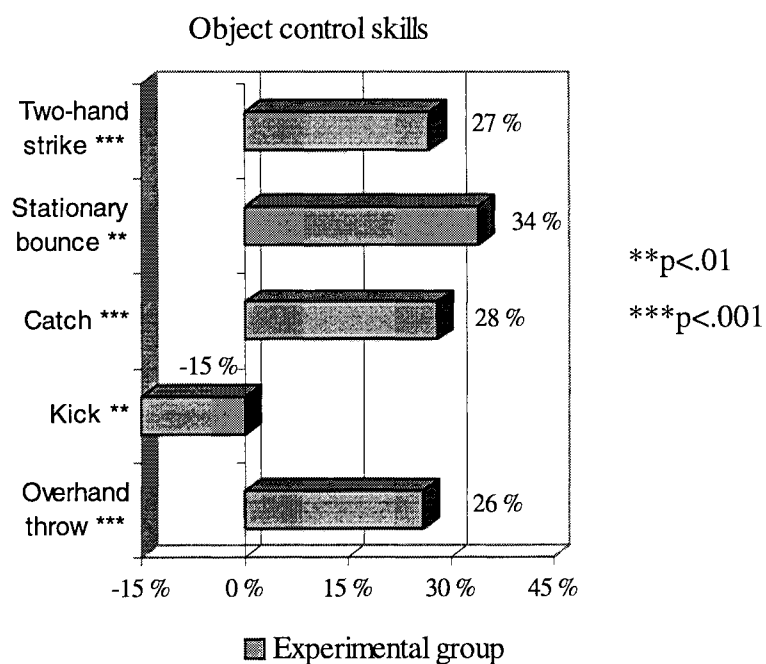


FIGURE 13. The effect of the training program on object control skills

8.2.3 The effect of the training program on gross motor skills by gender

The effect of the intensified training program on gross motor skills was investigated in the experimental group (14 female, 37 male) by using standard scores. The analysis was done by t-test for independent samples. The results indicated that the improvement of males was better in locomotor skills and the improvement of females better in object control skills.

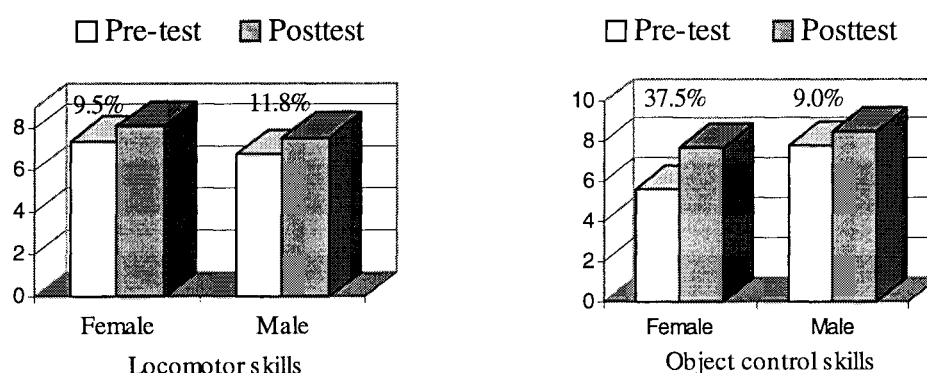


FIGURE 14. The improvement of locomotor and object control skills by gender

The total improvement of gross motor skills was similar in both of the groups. The group of females improved slightly more than the group of males.

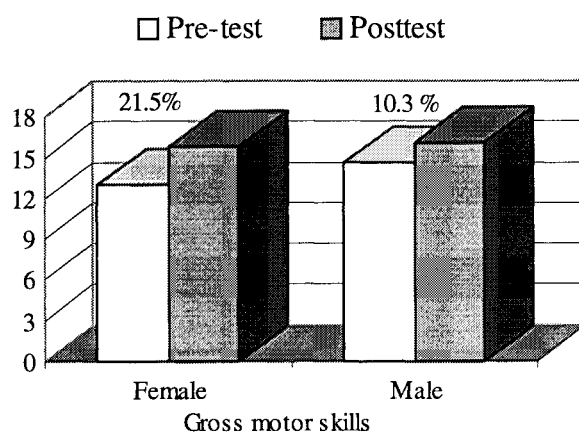


FIGURE 15. The improvement of gross motor skills by gender

8.2.4 The effect of the training program at different age level

The effect of the training program at different age level was investigated in oneway anova. The subjects from the experimental group were divided into five different groups based on age level in the pre-test. The results indicated that there were differences between the means of 8 years old and 10 years old subjects ($p < .05$). It can be concluded that level the biggest differences in motor performance occurred between these two groups.

TABLE 4. The effect of the training program at different age level

GROUP	n	Mean	SD	F	df	p
6 years old	8	1.63	4.53	1.55	4,46	.20
7 years old	16	1.34	3.27			
8 years old *	12	3.04	2.56			
9 years old	10	2.05	3.18			
10 years old *	5	-1.40	4.31			

*) LSD-test: $p < .05$

9 DISCUSSION

The level of gross motor skills in children with communication disorders was examined in this study. The interpretation was made by comparing the results to the normed data of the TGMD. The effect of the intensified training program on these skills was examined by comparing the results between the experimental and control groups. The effect was also investigated by age and gender.

9.1 The level of gross motor skills in children with communication disorders

The gross motor skills are low in children with communication disorders. In this study almost 70 % of the subjects had at least moderate motor problems. The results indicated that none of the groups of children with communication disorders reached the level of average in gross motor skills compared to the norms. Only the group of 6-year old children achieved the level of average in the locomotor subtest. This indicated that the motor problems are general in children with communication disorders. On the basis of these results it can be concluded that there is the correlation between language and motor development as expected (Lahey 1988, 120; Tervola-Laine 1987, 62). The findings indicated that the constancy of clumsiness seems to be fairly continuing, even an increasing problem.

There are a lot of individual differences in motor performance in children with communication disorders. Only 1 % of the subjects had gross motor skills above average compared to the TGMD. Some common features in motor performance of the subjects could be found. First, the higher were the demands of the motor tasks the lower were the performance level. Especially in skills, which demanded rhythm- and coordination skills appeared to have difficulties. For example in run, eight of ten subjects performed perfectly, while in skip it was only one of ten. These findings supported the lateralisation fact. Tasks which demand complicated neuromotor program and integration from the hemispheres are more difficult. Second, in the ball skills, which demanded quick ability

to discriminate and sequence the objects for the subjects, existed more problems. For example in overhand throw and catch four of ten subjects performed all the performance criteria, while it was in kick less than one. The weak results in ball skills were supported in the study of Pennanen & Rantakokko (1994).

The results between boys and girls were quite similar. Females performed better in locomotor subtest and correspondingly, males better in object control subtest. Only in skip ($p < .001$, females better) and in overhand throw ($p < .01$, males better) the differences between females and males were significant. It is presumable that the activities in play and games, which girls often do, will develop rhythm and coordination skills. Similarly, the activities and plays with required objects, will develop the eye-limb coordination of boys. Surprisingly, the differences in the other locomotor skills, like in gallop and hop, were not significant between gender. The findings of this study are supported in the study of Holopainen (1986, 33). According to her, females perform better in skipping, movement efficiency and the vision and motor coordination. The males perform better in throwing and in kicking. Only the results of kick in her and our study were contradicted. The better results of the females in kick could not be explained with any specific reasons. It can be supposed that the performance criteria which were based on American football may have had an affect on the results of the males who did the kick using the European style.

9.2 The effect of the intensified training program on gross motor skills

In this study it was certified that gross motor skills in children with communication disorders can be improved by physical training. Even the findings were not as clear as expected the training program had an influence on the children's gross motor skills. Especially, in object control subtest the improvement between the groups was significant ($p < .05$). The improvement in locomotor subtest between the groups was not as clear as expected. It can be supposed that the training, which was greatly based on the exercises completed with different equipment, effected more on the object control skills.

The results in four of the five object control skills improved significantly. This indicated that the training program completed between the pre- and posttests influenced especially on the children's visual-perception judgement and the confidence to control objects. According to some studies (Gallahue 1982, 318; Cratty 1994, 203-59) the visual process affects on the language skills too. In this viewpoint the results can be considered important and promising for the future studies. In kick the results worsened significantly. The decreased posttest results may be explained by the uncontrolled factors taking not account beforehand. In the previous chapter it was discussed of the cultural factors. The pitch of the two-hand strike differed from the Finnish baseball pitch in the TGMD. Still the results of the two-hand strike in the posttest improved significantly. An other explanation may be found from the test reliability. In this case, however, it is supposed that the two testers who judged the posttest results could not make the same mistakes.

In locomotor subtest the improvement was not as clear as it was in object control subtest. Still, the results were better or stayed stable in all of locomotor skills. In three of these skills the improvement was remarkable. The greatest growth occurred in skip (37 %) and in leap (25%), even though the result of the horizontal jump was statistically the most significant. In slide, hop and gallop the improvement in percentages was lower. Supposedly these skills do not require coordination from the hemispheres as much as the same leg is leading while moving. Probably the different jump trainings which were done with and without equipment affected to the results of the horizontal jump. The findings of these three improved skills may support the fact that the physical training influenced positively on the children's ability to integrate and coordinate. This is important result for the future research, as the motor problems in children with communication disorders are mainly connected to the poor motor planning (Lazarus 1990, 241-242).

The total improvement on gross motor skills was similar between the gender. The better results of the females were a consequence of the greater improvement on the object control subtest (37,5%). Male's improvement was less in both of the subtests. It can be supposed that the lower pretest results of the females in the object control skills were easier to be improved in the posttest. Other unexpected factors may also have affected to

the results, like motivation or concentration. According to Tervola-Laine (1987, 42) the qualitative differences between clumsy girls and boys can not be considered remarkable. In the future it would be interesting to investigate the quantitative differences between genders in children with communication disorders.

At different age level the effect of the training program on gross motor skills was quite similar. Between the results of 8-year old and 10-year old subjects had differences. The findings indicated that the training program effected most in the results of 8-year old and least in the results of 10-year old subjects. The findings support the fact that clumsiness seems to be fairly continuing problem in children with communication disorders. The gross motor skills of the 8-year old subjects developed most. It can be supposed that the training (motivational factors, time and methods of the training) influenced best on their skills. These findings may give some interesting ideas for the future researcher who are interested to investigate the gross motor skills at different age level of these children.

9.3 The physical training in children with communication disorders

The main purpose of the physical training is to develop motor skills. In children with communication disorders this is very important, as the physical training lead to the improvement of language too. Physical training should be based on different methods, as Rintala & Palsio (1994) indicated, there are differences between the effects of the programs. In this way it is possible to take into account the child as an individual. Even if the meaning is to improve the physical skills, the training should contain social and psychosocial aspects too. Especially in children with communication disorders this is important, because they are often more introverted and judge themselves less competent than their peers in regarding physical and social skills (Miyahara 1994; Schoemaker & Kalverboer 1994).

In children with communication disorders there exist often problems in locating body in space, in other words sensory-perceptual problems. For this reason the physical training should begin from the easy exercises, in which the children have to perceive their own

body and to learn the names of the different body parts. The basic movements which are easy to understand, give the feeling of success for the children. Afterwards it is easier to learn new skills, when the children can differentiate the right and left legs and arms from one another (Holopainen 1986, 102). Tasks, like running, rolling or jumping are good, because the demands of the tasks do not grow too high. Children with communication disorders have often problems in memory. In the beginning easy tasks are good, because the memory deficiencies do not prevent to learn the complex movements. The trainer should use children's own perception, which will increase positive experiences. Confidence and positive attitude towards physical activity will reinforce the tendency to like situations requiring motor competence.

In this study the training program were versatile, which emphasized the child as a "*holo unity*". It concentrated to develop children's body awareness skills, fundamental movements, object controls skills and the emotional and physical security. It was based on the three different programs, which were executed as a separate sessions. Each training supported the other two training programs. The body awareness training of Sherborne increased the self-confidence of the children, which effected on the courage of the children to perform in motor skills. When the training is directed to the right developmental level of the children it will develop most the self-confidence and the body awareness of the children (Cratty 1994, 324; Merviö 1996, 40-41). Cratty has also stated that the training should be at least forty hours long and carry out two to five times per week (Cratty 1996, 326). In this study the training was completed for 10 weeks, three times per week. It is presumable that the completed training time in this study was too short for the children with communication disorders who have serious motor problems.

9.4 Further recommendations

This study indicated that motor problems are closely connected to the communication disorders. The best and postive part in this study was that with the help of physical training it is possible to influence on gross motor skills of children with communication disorders. If the better motor skills lead to the improvemet of linguistic skills too, the

value of physical training is emphasized. In this study the differences between the experimental and control groups were not as big as expected in all the skills. Even though it was not a desired result, it suggested that physical education, child's normal development and general interest towards sport effect on the results too. This study produced a lot of ideas how to develop the motor skills in children with communication disorders. In the end of this study we would like to express some future recommendations for the researcher who are interested in continuing this work.

The interpretational problems arise when attempting to correctly evaluate the efforts of children in different cultures (Cratty 1994, 303). In this study the criteria of the TGMD caused few problems. However, the problems (criteria of kick and two-hand strike) were taking into account while analyzing the results. A bigger sample size would have conferred researcher safer ground for making the analysis. In this study the different size of the experimental and control groups caused few problems.

As was mentioned in the beginning of the study our interest as a physical educator is to arrange lessons, which could develop the children's motor and in the best situation other, like linguistic skills. As was stated in the study of Rintala & Palsio (1994) the physical education lesson is an important part of the physical training for the children with communication disorders. Even the results of that study were encouraging, the quantity and quality factors of the physical education lessons in other schools may not be as good. The question is educational but also financial. Our opinion is that in some schools it could be organized for these children physical educational lessons, which are based on the level of motor skills instead of their age. In this way the children who have very heterogenic motor skills could be taken into account more holistically. It is easier for the children to play games and train skills, if they can play with their own level. An other idea is to organize sport clubs for the children who have motor problems after the school day. The problem in this idea is again financial but also a motivational. How to motivate children who do not have good experiences of physical exercise. With these few physically impelmented ideas we would like give some advice for the people who work with these children. It is important that children who are not good in physical exercise can progress in their own level. Rewarding methods and positive attitudes give safer

ground for the children to grow towards more individual, independent and holistic adulthood.

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APPENDIX 1 Perceptual-motor theories

Developer	Basis of the theory - approach	The main ideas	Ideas of treatment
Ayres	A sensory integrated approach: by controlling input that activates the ability to organize sensory information for later use can be improved.	Therapy consists of a variety of sensory experiences and motor activities thus enhancing normal neural development. Therapy follows an evolutionary progression. The aim is to enhance the brain's ability to learn how to do things by giving it sensory stimulants. The specific skill is not a teaching tool. Enhancing maturation at the lower level functions create the foundation to become more competent at the higher levels.	<ol style="list-style-type: none"> 1. Influencing sensation and response. 2. Tactile stimulation. 3. Vestibular stimulation. 4. Other proprioceptive stimuli. 5. Adaptive responses. 6. Precautions.
Barch	Movigenics - an experimental curriculum that is based on 12 dimensions of learning.	Man is seen as a moving being within a spatial world. A perceptocognitive system giving feedback is essential to developing movement efficiency. There is relationship between communication and movement, so that communication depends on the ability to process information from perceptual cognitive systems and this ability is dependent on efficient movement patterns.	<ol style="list-style-type: none"> 1. Muscular strength 2. Dynamic balance 3. Spatial awareness 4. Body awareness 5. Visual dynamics 6. Auditory dynamics 7. Kinaesthesia 8. Tactual dynamics 9. Bilaterality 10. Rhythm 11. Flexibility 12. Motor planning
Cratty	Teaching movement through developmental sequences.	High level cognitive abilities do not find their roots in low level motor skills, but motor training can improve, e.g. childrens' opinions of themselves. This creates a more positive climate which results in higher academic attainment. A Three-level theory: motor performance is influenced on three levels: 1. General behavioural supports, includes language and cognitive behaviour with motor learning; 2. Perceptual-motor ability rates: general constructs in motor learning (e.g. static strength); 3. Tasks specifics: factors that are specific to particular situations. Having a well-developed body is important for children to be able to move with speed, agility, balance and graced; to have strength and endurance.	<ol style="list-style-type: none"> 1. Body perception 2. Balance 3. Locomotion 4. Agility 5. Throwing 6. Catching
Delacato	A neurological organization and patterning approach; individual human development follows the sequential continuum of neurological development.	Cells of the brain which have never damaged and those that remain intact can be trained to take over the functions of the damaged cells. Therapy attempts to improve to the development of a specific brain level. The intensity, frequency and duration of exercises sends sensory inputs to the brain. These inputs treat the damaged area of brain.	Patterning-method: It is treating the brain instead of brain injury. The limbs are manipulated to produce movements which are the responsibility of the damaged level. These levels are medulla, pons, midbrain and cortex.

Developer	Basis of the theory - approach	The main ideas	Ideas of treatment
Frostig	A learning through movement approach, perception is the ability to recognize stimuli; not only in receiving organs like the eyes or ears, but in the brain itself. The developed perceptual skills may result in academic success.	The program aim is to remediate that specific part of perceptual areas that is weak. The program is not only remedial, but developmental as well. Besides visual perception to perceptual functioning must also be adequate in order to develop gross and fine muscle coordination, eye movements, body image and concept-skills.	<ol style="list-style-type: none"> 1. Eye-motor 2. Figure-ground 3. Perceptual-constancy 4. Position in space 5. Spatial relations
Getman	An action program for developing visual perception; <ol style="list-style-type: none"> 1. Vision is intelligence 2. 80% of what is learned is learned visually 3. Children grow up to live in a visual world 4. Visual success is reading success. 	Remedial approach emphasizes four things: "Educational success depends heavily upon on visual adequacy. Direct experience enhances perceptual development. Children learn to perceive and learn to learn. Perceptual success follows a logical, systematic sequence of development."	<ol style="list-style-type: none"> 1. General movement patterns 2. Special movement patterns 3. Eye movement patterns 4. Vision-language patterns 5. Visualization patterns
Kephart	A developmental approach to teaching motor generalizations.	Sensory motor is the base of all learning. The learning should include more general abilities than specific skills. Breaking down activities into more basic skills results in success in developing readiness. Training is not a goal, but it is a vehicle, therefore emphasis of training is from task-oriented to process-oriented. Three stages of learning development are <ol style="list-style-type: none"> 1. Practical stage, which is based on posture and maintenance of balance. 2. Subjective stage, which is based on the motor generalizations of contact and of locomotion. 3. Objective stage, which is based on the advanced motor generalizations of receipt and propulsion patterns. 	<ol style="list-style-type: none"> 1. Chalkboard training 2. Sensorimotor training 3. Ocular control training 4. Training form perception

Dale Ulrich

TGMD-testin suorituskriteerit

JUOKSU, (run)

1. Molemmat jalat ilmassa hetkellisesti
2. Käsien vastaliike, kyynärpäät koukussa
3. Askellus lähes suoralla viivalla
4. Vapaan jalan koukistus n. 90 astetta

LAUKKA, (gallop)

1. Askel etujalalla, takajalka astuu lähelle etujalkaa
2. Jalat yhtäaikaan ilmassa hetkellisesti
3. Kädet koukussa vyötärön tasolla
4. Osaa johtaa molemmilla jaloilla

KINKKAUS, (hop)

1. Vapaa jalka koukussa vartalon takana
2. Vapaan jalan rytminen heilahdus vauhtia antaen
3. Ilmalennon aikana kädet heilahtavat koukussa eteen
4. Osaa kinkata molemmilla jaloilla

LOIKKA, (leap)

1. Ponnistus ja alastulo eri jaloilla
2. Jalat yhtäaikaan ilmassa kauemmin kuin juoksussa
3. Johtavan jalan vastakkainen käsi kurottaa eteen

TASAPONNISTUS ETEEN, (horizontal jump)

1. Ennen hyppyä polvet koukistuvat ja kädet ojent. vartalon taakse
2. Kädet ojentuvat voimakkaasti eteen-ylös (täysin pään yläpuolella)
3. Ponnistus ja alastulo tasajalkaa
4. Kädet viedään alas alastulossa

HYPPYASKEL, (skip)

1. Rytminen askel-hypyn toisto vuorojaloin
2. Vapaa jalka seuraa lähellä lattiaa hypyn aikana
3. Kädet jalkojen vastaliikkeenä n. vyötärön tasolla

SIVULAUKKA, (slide)

1. Vartalo sivuttaim menosuuntaan
2. Sivuauskelta seuraa takajalan liuku lähelle etujalkaa
3. Molemmat jalat hetkellisesti ilmassa
4. Laukka onnistuu molempiin suuntiin

KAHDEN KÄDEN MAILASIVULYÖNTI, (two-hand strike)

× 1. Ote: dominoiva käsi toisen yläpuolella

2. Ei-hallitsevan käden puoleinen kylki kohti heittäjää *(jalkaterät samansuuntaisina)*

3. Vartalon kierto

4. Painonsiirto etummaiselle jalalle

PALLON POMPOTUS, (stationary bounce)

× 1. Kosketus yhdellä kädellä n. vyötärön tasolla

2. Kosketus palloon sormilla, ei lapsäyttään

× 3. Pallo käy lattiassa pompottavan käden puol. jalan sivulla / *tai edessä*

KIINNIOTTO, (catch)

× 1. Valmiusasennossa kädet koukussa vartalon edessä

2. Kädet ojentuvat pallon lähestyessä

3. Pallo vangitaan käsin, ei käsivarsin

4. Kiinniotto joustaen, pallon liikevoima kuolettuu *kädet kouristuvat*

POTKU, (kick)

× 1. Nopea keskeytymätön pallon lähestyminen

× 2. Vartalo nojautuu taakse jalan osuessa palloon

3. Potkujan vastakkainen käsi heilahtaa eteen

4. Saatto hyppäämällä vapaalle jalalle *(non-kicking-foot)*

YLIOLANHEITTO, (overhand throw)

× 1. Heittokäden kaari alakautta heittoon jännittyessä *heittokäsi ottaa vauhtia vartalon taka-*

2. Lantion ja hartioiden kierto heitossa

3. Painonsiirto vastakkaiselle jalalle

4. Saatto viistosti vartalon poikki

Specific Subtest Instructions and Illustrations

Subtest 1. Locomotor Skills

SKILL: Run

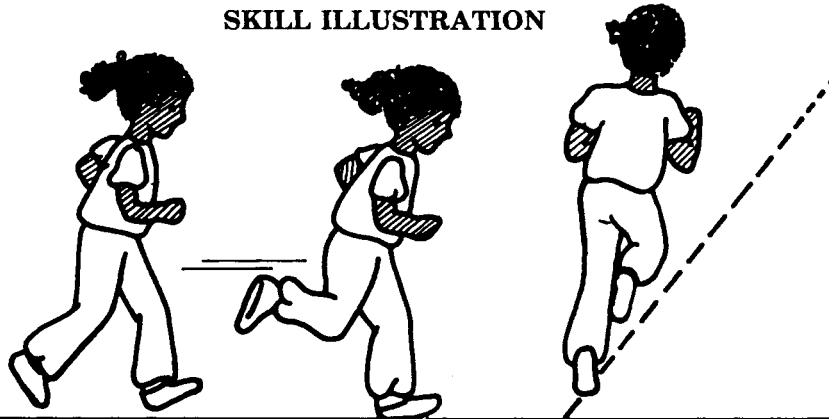
EQUIPMENT/CONDITIONS: A minimum of 50 feet of clear space and masking tape, chalk, or other marking device.

DIRECTIONS: Mark off two lines 50 feet apart. Instruct the student to "run fast" from one line to the other.

PERFORMANCE CRITERIA:

1. Brief period where both feet are off the ground.
2. Arms move in opposition to legs, elbows bent.
3. Foot placement near or on a line (not flat footed).
4. Nonsupport leg bent approximately 90 degrees (close to buttocks).

SKILL ILLUSTRATION



SKILL: Gallop

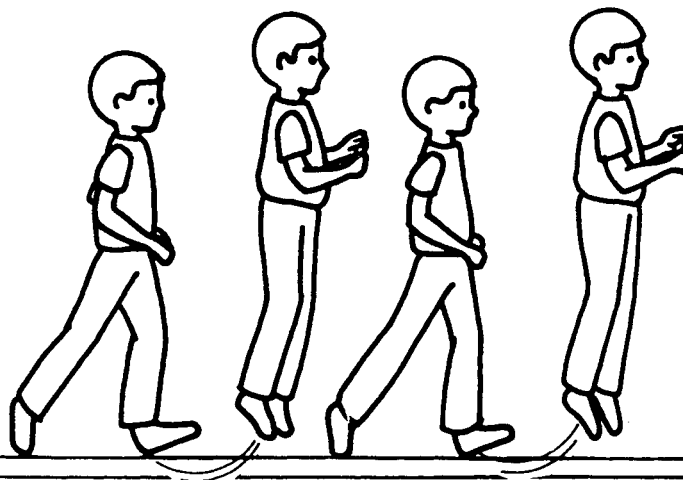
EQUIPMENT/CONDITIONS: A minimum of 30 feet of clear space.

DIRECTIONS: Mark off two lines 30 feet apart. Tell the student to gallop from one line to the other three times. Tell the student to gallop by leading with one foot and then the other.

PERFORMANCE CRITERIA:

1. A step forward with the lead foot followed by a step with the trailing foot to a position adjacent to or behind the lead foot.
2. Brief period where both feet are off the ground.
3. Arms bent and lifted to waist level.
4. Able to lead with the right and left foot.

SKILL ILLUSTRATION



SKILL: Hop

EQUIPMENT/CONDITIONS: A minimum of 15 feet of clear space.

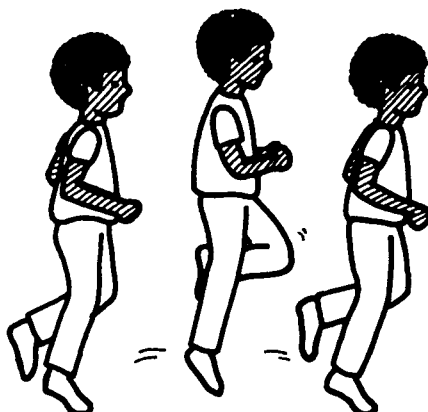
DIRECTIONS: Ask the student to hop three times, first on one foot and then on the other.

PERFORMANCE CRITERIA:

1. Foot of nonsupport leg is bent and carried in back

of the body.

2. Nonsupport leg swings in pendular fashion to produce force.
3. Arms bent at elbows and swing forward on take off.
4. Able to hop on the right and left foot.*

SKILL ILLUSTRATION

*This criteria does not require the performance of the other three.

SKILL: Leap

EQUIPMENT/CONDITIONS: A minimum of 30 feet of clear space.

DIRECTIONS: Ask the student to leap. Tell the student to take large steps by leaping from one foot to the other.

PERFORMANCE CRITERIA:

1. Take off on one foot and land on the opposite foot.
2. A period where both feet are off the ground (longer than running).
3. Forward reach with arm opposite the lead foot.

SKILL ILLUSTRATION**SKILL: Horizontal Jump**

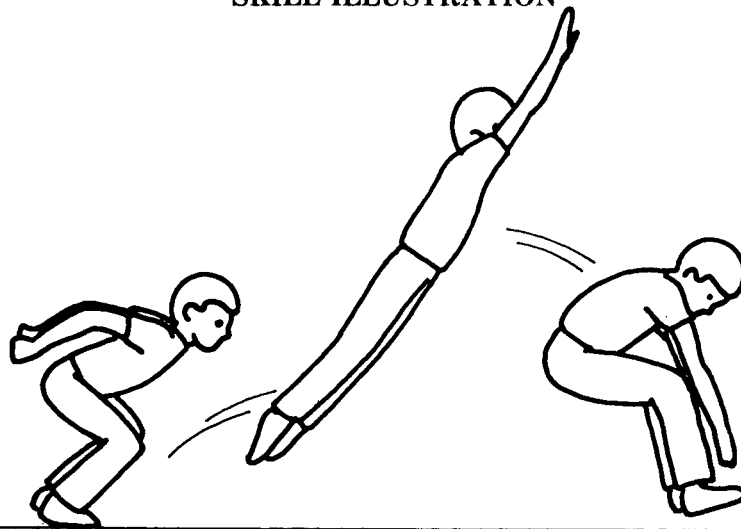
EQUIPMENT/CONDITIONS: A minimum of 10 feet of clear space and masking tape, or other marking device.

DIRECTIONS: Mark off a starting line on the floor, mat, or carpet. Have the student start behind the line. Tell the student to "jump far."

PERFORMANCE CRITERIA:

1. Preparatory movement includes flexion of both knees with arms extended behind the body.
2. Arms extend forcefully forward and upward, reaching full extension above head.
3. Take off and land on both feet simultaneously.
4. Arms are brought downward during landing.

SKILL ILLUSTRATION



SKILL: Skip

EQUIPMENT/CONDITIONS: A minimum of 30 feet of clear space and masking tape, or other marking device.

DIRECTIONS: Mark off two lines 30 feet apart. Tell the student to skip from one line to the other three times.

PERFORMANCE CRITERIA:

1. A rhythmical repetition of the step-hop on alternate feet.
2. Foot of nonsupport leg carried near surface during hop phase.
3. Arms alternately moving in opposition to legs at about waist level.

SKILL ILLUSTRATION



SKILL: Slide

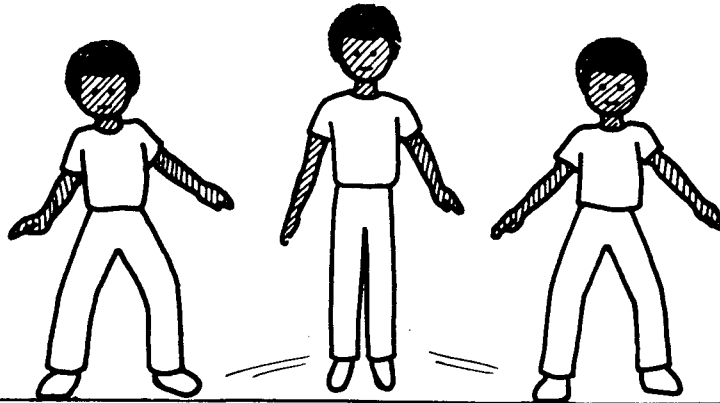
EQUIPMENT/CONDITIONS: A minimum of 30 feet of clear space and masking tape, or other marking device.

DIRECTIONS: Mark off two lines 30 feet apart. Tell the student to slide from one line to the other three times facing the same direction.

PERFORMANCE CRITERIA:

1. Body turned sideways to desired direction of travel.
2. A step sideways followed by a slide of the trailing foot to a point next to the lead foot.
3. A short period where both feet are off the floor.
4. Able to slide to the right and to the left side.*

SKILL ILLUSTRATION



*This criteria does not require the performance of the other three.

Subtest 2. Object Control Skill Subtest

SKILL: Two-Hand Strike

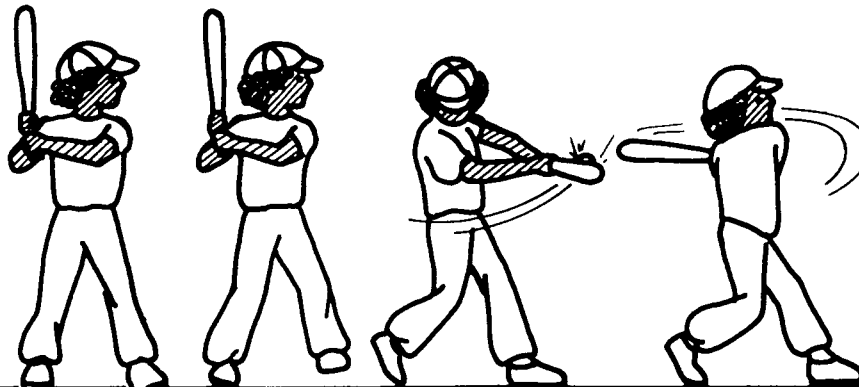
EQUIPMENT/CONDITIONS: A 4-6 inch light-weight ball and a plastic bat.

DIRECTIONS: Toss the ball softly to the student at about waist level. Tell the student to hit the ball hard. Count only those tosses that are between the student's waist and shoulders.

PERFORMANCE CRITERIA:

1. Dominant hand grips bat above nondominant hand.
2. Nondominant side of body faces the tosser (feet parallel).
3. Hip and spine rotation.
4. Weight is transferred by stepping with front foot.

SKILL ILLUSTRATION



SKILL: Stationary Bounce

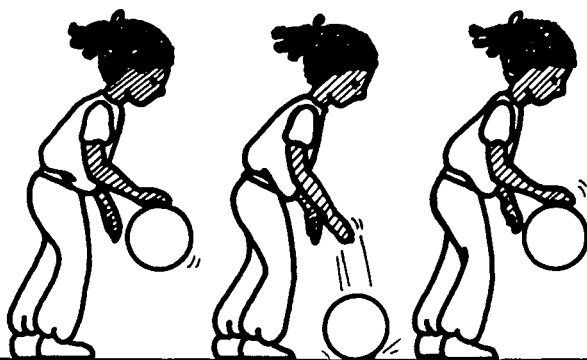
EQUIPMENT/CONDITIONS: An 8-10 inch playground ball and a flat hard surface.

DIRECTIONS: Tell the student to bounce the ball three times using one hand. Make sure the ball is not underinflated. Repeat three separate trials.

PERFORMANCE CRITERIA:

1. Contact ball with one hand at about hip height.
2. Pushes ball with fingers (not a slap).
3. Ball contacts floor in front of (or to the outside of) foot on the side of the hand being used.

SKILL ILLUSTRATION



SKILL: Catch

EQUIPMENT/CONDITIONS: A 6-8 inch sponge ball, 15 feet of clear space, masking tape or other marking device.

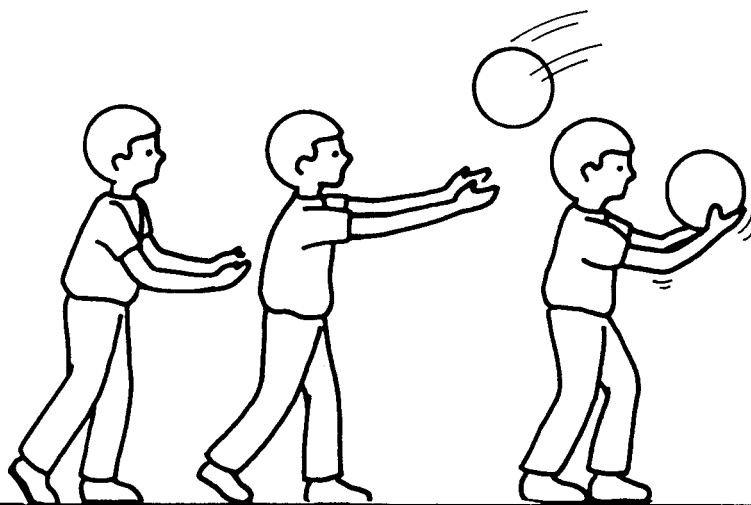
DIRECTIONS: Mark off two lines 15 feet apart. Student stands on one line and the tosser on the other. Toss the ball underhand directly to student with a slight arc, saying "catch it with your hands." Only

count those tosses that are between student's shoulders and waist.

PERFORMANCE CRITERIA:

1. Preparation phase where elbows are flexed and hands are in front of body.
2. Arms extend in preparation for ball contact.
3. Ball is caught and controlled by hands only.
4. Elbows bend to absorb force.

SKILL ILLUSTRATION



SKILL: Kick

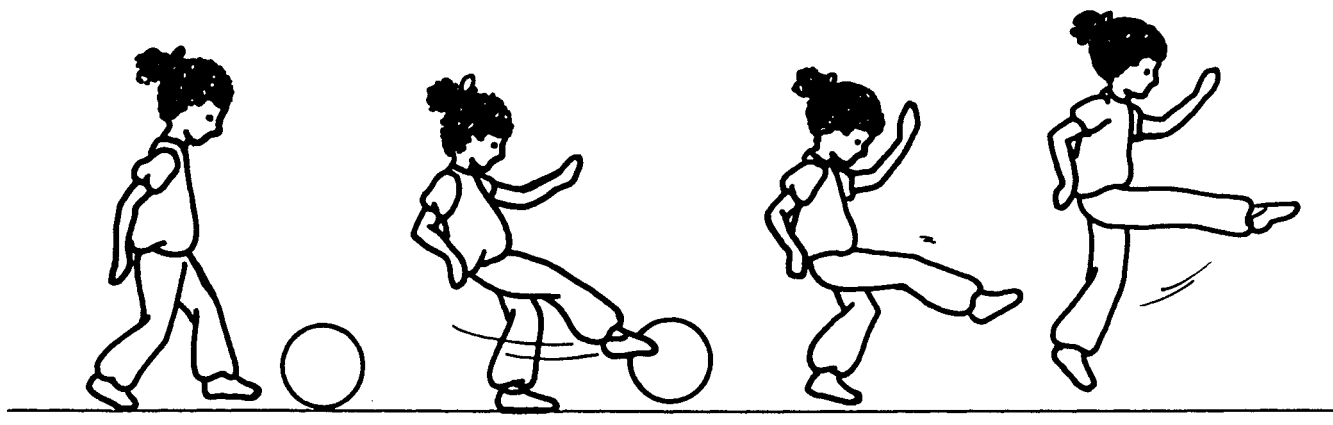
EQUIPMENT/CONDITIONS: An 8-10 inch plastic or slightly deflated playground ball, 30 feet of clear space, masking tape or other marking device.

DIRECTIONS: Mark off one line 30 feet away from a wall and one that is 20 feet from the wall. Place the ball on the line nearest the wall and tell the student to stand on the other line. Tell the student to kick the ball "hard" toward the wall.

PERFORMANCE CRITERIA:

1. Rapid continuous approach to the ball.
2. The trunk is inclined backward during ball contact.
3. Forward swing of the arm opposite kicking leg.
4. Follow-through by hopping on nonkicking foot.

SKILL ILLUSTRATION



SKILL: Overhand Throw

EQUIPMENT/CONDITIONS: A tennis ball, a wall, and 25 feet of clear space.

DIRECTIONS: Tell the student to throw the ball "hard" at the wall.

PERFORMANCE CRITERIA:

1. A downward arc of the throwing arm initiates the

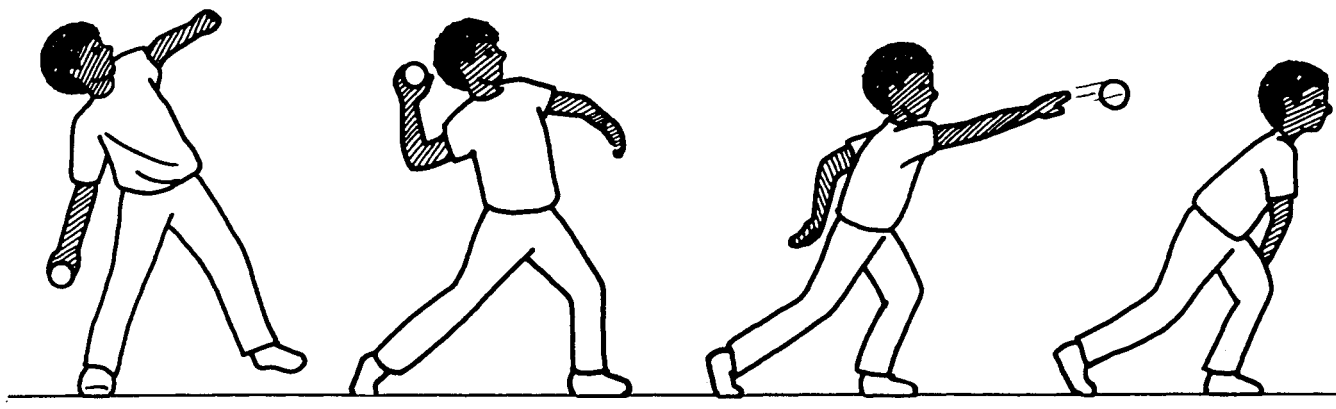
windup.

2. Rotation of hip and shoulder to a point where the nondominant side faces an imaginary target.

3. Weight is transferred by stepping with the foot opposite the throwing hand.

4. Follow-through beyond ball release diagonally across body toward side opposite throwing arm.

SKILL ILLUSTRATION



TGMD
OBSERVONTILOMAKE

NIMI _____ IKÄ _____

APPENDIX 3.

JUOKSU	TASAPONNISTUS ETEEN	PALLON POMPOTUS O / V
1. _____	1. _____	1. _____
2. _____	2. _____	2. _____
3. _____	3. _____	3. _____
4. _____	4. _____	
LAUKKA	HYPPYASKEL	KIINNIOTTO
1. _____	1. _____	1. _____
2. _____	2. _____	2. _____
3. _____	3. _____	3. _____
4. _____		4. _____
KINKKAUS	SIVULAUKKA	POTKU O / V
1. _____	1. _____	1. _____
2. _____	2. _____	2. _____
3. _____	3. _____	3. _____
4. _____	4. _____	4. _____
LOIKKA	KAHD.KÄD. MAILASIVUL. O / V	YLIOLANHEITTO O / V
1. _____	1. _____	1. _____
2. _____	2. _____	2. _____
3. _____	3. _____	3. _____
	4. _____	4. _____
RAAKAPISTEET:	STANDARDIPISTEET:	VERY SUPERIOR _____
LIIKESUOR. _____	LIIKESUOR. _____	SUPERIOR _____
VÄLINES. _____	VÄLINES. _____	ABOVE AVER. _____
		AVERAGE _____
YHT. _____	SUMMA _____	BELOW AVER. _____
		POOR _____
	QUOTIENT _____	VERY POOR _____

TGMD
OBSERVONTILOMAKE

NIMI _____ IKÄ _____

JUOKSU	TASAPONNISTUS ETEEN	PALLON POMPOTUS O / V
1. _____	1. _____	1. _____
2. _____	2. _____	2. _____
3. _____	3. _____	3. _____
4. _____	4. _____	
LAUKKA	HYPPYASKEL	KIINNIOTTO
1. _____	1. _____	1. _____
2. _____	2. _____	2. _____
3. _____	3. _____	3. _____
4. _____		4. _____
KINKKAUS	SIVULAUKKA	POTKU O / V
1. _____	1. _____	1. _____
2. _____	2. _____	2. _____
3. _____	3. _____	3. _____
4. _____	4. _____	4. _____
LOIKKA	KAHD.KÄD. MAILASIVUL. O / V	YLIOLANHEITTO O / V
1. _____	1. _____	1. _____
2. _____	2. _____	2. _____
3. _____	3. _____	3. _____
	4. _____	4. _____
RAAKAPISTEET:	STANDARDIPISTEET:	VERY SUPERIOR _____
LIIKESUOR. _____	LIIKESUOR. _____	SUPERIOR _____
VÄLINES. _____	VÄLINES. _____	ABOVE AVER. _____
		AVERAGE _____
YHT. _____	SUMMA _____	BELOW AVER. _____
		POOR _____
	QUOTIENT _____	VERY POOR _____

1. VARIAATIO (helpompi)

1. KÄVELY/JUOKSU

- vk I-II:** "Ylämäki-alamäki"
Juostaan rytmisesti *paikalla* tasaista maastoa = tavall. hölkkäjuoksu
ylämäkeä= hitaammin eteenpäin kallistuen, jalat taakse polvia eteen nostaen
alamäkeä= nopeammin taakse kallistuen
Sama *eteenpäin liikkuen*.
- vk III-IV:** "Herätys"
Maataan rauhassa mukavassa asennossa.
Herätyskello soi - nopeaan juoksuun (kiire kouluun !)
Kellon soitto lakkaa - istumaan
Kello soi - reipas kävely kotiin nukkumaan. Jatkuu.
- vk V-VI:** "Liikennepoliisi"
Poliisi=ope ohjaa käsimerkein ja sanallisin ohjein liikennettä = lapsia.
Kävellään eteen-taakse-vasemmalle-oikealle suuntia vaihdellen.
Pollin vihellyksestä liikenne pysähtyy nopeasti paikalleen.
Jatketaan sopivasti suuntia ja pysähdyksiä vaihdellen sopiva aika.
- vk VII-VIII:** "Taikurihippa"
Yksi on hippa = taikuri. Hipan kosketuksesta muututaan mitä erilaisimmiksi patsaiksi.
Muut saavat koskettamalla pelastaa patsaan.
- vk IX:** "Mielikuvajuoksut"
Juostaan vapaasti erilaisten mielikuvien mukaan (ope näyttää mallin)
- juokse kuin vikkela hiiri (nopea, lyhyt askel)
- juokse kuin kömpelö norsu (raskas, hidas)
- juokse kuin vaaniva leijona (pitkä, hidas)
- juokse pehmeästi kuin kissa (kevyt, äänetön)
- vk X:** "Mielikuvajuoksut"
Juostaan vapaasti erilaisten mielikuvien mukaan
- juokse kuin jääpuikko/tikku-ukko (tana-juoksu)
- juokse koiraa pakoon (nopea)
- juokse korkokengillä (varpailla, lyhyt)
- juokse paksussa lumihangessa (raskas, hidas, iso askel)

2. PUOLAPUUT

Huom! Penkin kaltevuus ja liikkumiskorkeus säädellään lasten taitotason mukaan.

- vk I-II : konttaaminen penkkiä pitkin ylös - sivuttain kävely puolapuilla-
liuku alas penkkiä pitkin
- vk III-IV: vetämällä ylös penkkiä pitkin - sivuttain kävely puolapuilla - liuku alas
- vk V-VI: vetämällä ylös - liikkuminen sivuttain - hyppy alas
- vk VII-VIII: kipuaminen penkkiä pitkin ylös- liikkuminen sivuttain - liuku alas -
kiipeäminen ylös puolapuita - hyppy alas
- vk IX-X: kiipeäminen puolapuita ylös - liuku alas - kiipeäminen ylös - hyppy alas

2. VARIAATIO (vaativampi)

1. KÄVELY/JUOKSU

- vk I-II:** "Lenkillä"
Hölkätään tasaisesti - merkistä spurtti nopeasti - merkistä kävely rauhallisesti (Hölkä !, Spurtti !, Kävely !).
Open sanallisten ohjeitten mukaan lenkkeillään (äänenpaino tärkeä).
- vk III-IV:** "Hälytys"
Maataan mukavassa asennossa,
herätyskello soi - juostaan nopeasti pakoon
kello lakkaa soimasta - mennään turvapaikkaan (esim. nurkat)
pilli soi = vaara ohi - kävellään rauhallisesti kotiin nukkumaan (=makaamaan omalle paikalle.
Toistetaan.
- vk V-VI:** "Liikennepoliisi"
Vrt. helpompi variaatio I, mutta myös juosten.
- vk VII-VIII:** "Patsashippa"
Yksi (2 ?) hippa(a). Hipan kosketuksesta muututaan erilaisiksi patsaiksi.
Muut pelastavat tekemällä täsmälleen samanlaisen patsaan pelastettavan eteen.
- vk IX:** "Mielikuvajuoksut"
Samat eläinmielikuvat kuin 1. variaatiossa.
- vk X:** "Mielikuvajuoksut"
Samat kuin 1. variaatiossa


2. PUOLAPUUT

- vk I:** penkkiä pitkin vetämällä ylös - liikkuminen sivuttain puolapuilla -
liuku penkkiä pitkin alas
- vk II:** penkkiä pitkin kipuamalla ylös - liikkuminen sivuttain puolapuilla -
hyppy alas matolle
- vk III-IV:** penkkiä pitkin kipuamalla/ vetämällä ylös - liikkuminen sivuttain puolapuilla,
selkä seinään päin - hyppy alas matolle
- vk V-VI:** penkkiä pitkin kävelemällä ylös - liuku alas - kiipeäminen puolapuita ylös -
X-hyppy alas matolle
- vk VII-VIII:** penkkiä pitkin sivuttain kävely - liikkuminen puolapuilla selkä seinään päin -
kierrehyppy alas
- vk IX-X:** kiipeäminen puolapuita ylös - X- asento, kylki puolapuihin - liikkuminen puolapuita
pitkin sivuttain pyörien - kiipeäminen alas (korkeus lapsen rohkeuden mukaan)

3. TRAMPOLIINI

- vk I: perushyppelyä trampoliinilla ja alastulo patjalle
vk II: haara-perus-/ slalom - hyppyjä - alastulo matolle
vk III-V: vauhti penkkiä pitkin ja kynttilähyppy/ X-hyppy/ kerähyppy patjalle
vk VI-VIII: vauhti maasta ja hyppy patjalle (kynttilä-, X- ja kerähyppy)
vk IX-X: hyppyarkun päältä pudotushyppy - X-hyppy patjalle

4. HYPPYRATA/ RYTMIRATA JA STAATTINEN TASAPAINO

- vk I: hyppely vanteesta toiseen, viimeisellä jäädään esim. haikara-asentoon
(* = 1 jalka, O = 2 jalkaa)
OO**OO**
vk II: *O*O*O*O*
vk III: OO**O*O*
vk IV: *** ***(viivan yli)
*** ***(viivan alla)
vk V: sammakkohyppy vanteesta toiseen, vanteet peräkkäin
vk VI: tasahyppy vanteesta toiseen, vanteet sik-sak-muodostelmassa
vk VII: yhden jalan hyppy viivan yli (huom ! sama jalka) 
vk VIII: jänisloikan kehittäminen: hyppy penkille ja alas, penkille ja alas
vk IX: jänisloikka penkin yli vuorojaloin
vk X: jänisloikka penkin yli tasajaloin
- kaikkien hyppöjen päätteeksi loppuasento

5. HYPPYNARU

- vk I-II: hypyt tasajaloin
vk III-IV: hypyt yhdellä jalalla narun yli harpaten
vk V-VI: hypyt yhdellä jalalla
vk VII-VIII: hypyt tasajaloin taaksepäin pyörittäen
vk IX: hypyt vuorojaloin (o-o-v-v-o-o-v-v)
vk X: yhdellä hypyllä kaksi pyöritystä

6. NARUKÄVELY / PENKKIKÄVELY

- vk I: kävely narua pitkin eteenpäin, kanta aina varpaaseen
vk II: " " " taaksepäin, varvas kantaan
vk III: " " " eteenpäin silmät kiinni
vk IV: penkki oikeinpäin, kävely taaksepäin
vk V: " " kävely eteenpäin silmät kiinni
vk VI: penkki nurinpäin, kävely eteenpäin
vk VII: " " kävely sivuttain
vk VIII: " " kävely taaksepäin
vk IX: " " kyykkäykäynti
vk X: " " kävely eteenpäin hernepussi päällä

7. TARKKUUSHEITTO, -POTKU JA -LYÖNTI

- vk I-II: tarrapallon heitto tauluun
- vk III: voimistelupallon heitto saaviin
- vk IV: renkaiden tarkkuusheitto tuolinjalkoihin
- vk V-VI: pallon potku maaliin
- vk VII-VIII: sählymailalla pallo maaliin
- vk IX-X: suffeli-peli

8. HYPPIY RIMOJEN YLI JA KONTTAUS ALI

Huom ! kaksi rimaa/ narua

- vk I: hyppy suoran riman yli loikalla, ryömiminen ali
- vk II: tasahyppy riman yli, ryömiminen ali
- vk III: suora rima, yli-ali-yli-ali
- vk IV: hyppy vuorojaloin vinon riman yli korkeutta vaihdellen
- vk V-VI: rimat suorassa, eri tasoissa, loikat yli, ryömiminen ali
- vk VII-VIII: hyppy vinon riman yli loikaten, rimat samaan suuntaan
- vk IX-X: kuten VII-VIII, rimat eri suuntiin loikaten/ tasahypyllä

9. STAATTINEN TASAPAINO

- vk I-III: käden ja jalan kuvien mukaisia tasapainoasentoja
- vk IV: tasapainoilu tasapainolaudalla, jonka on oltava riittävän kaukana seinästä - ei tuen ottoa
- vk V: tasapainoilu laudalla hernepuski pään päällä
- vk VI: haikaraseisonta tasapainolaudalla
- vk VII-VIII: käden ja jalan kuvien mukaisia tasapainoasentoja (vaativampia kuin vk:lla I-II)
- vk IX-X: tasapainoilua voltittuynnyllä; istuen, polvilla ja seisten

10. KUPERKEIKKA

- vk I: kuperkeikka alamäkeen
- vk II: kuperkeikka alamäkeen, ilman käsiä ylös
- vk III: kuperkeikka tasaisella
- vk IV: kuperkeikka tasaisella, ilman käsiä ylös
- vk V: keinunta tasaisella, selälle- istumaan, kädet olkapäillä (yli, jos menee)
- vk VI: kuperkeikka taaksepäin alamäkeen
- vk VII-VIII: kuperkeikka taaksepäin tasaisella
- vk IX: kaksi kuperkeikkaa eteenpäin peräkkäin
- vk X: yksi kuperkeikka eteenpäin - käänös - yksi kuperkeikka taaksepäin

11. KIERIMINEN

Huom ! Vaihdellaan kierimissuuntaa

- vk I: kieriminen narua pitkin, kädet pään yläpuolella
- vk II-III: kieriminen alamäkeen ja tasaisella jatkuen
- vk IV-V: kieriminen alamäkeen ja ylämäkeen
- vk VI-VII: kieriminen suorana - kippurassa vaihdellen
- vk IX-X: kieriminen kahdella vierekkäisellä penkillä

YLEISIÄ OHJEITA PALLOILUTUNNEILLE

Lasten motoristen häiriöiden liikunnallinen kuntoutus 1995

Periaatteena palloilutunneissa on että kaksi peräkkäistä tuntia pidetään samalla ohjelmalla esim. Palloilu 1-2. tunti. MUTTA tunteihin on kuitenkin rakennettu kaksi tasoa: normaalilla tekstillä kirjoitettu 1. taso ja ISOILLA KIRJAIMILLA KIRJOITETTU 2. TASO. Taso 2 on tarkoitettu nopeasti eteneville ja taitavammille, mutta tehtäviä voivat kokeilla tietysti kaikki. Käytä harjaintaasi.

Tunneissa on paljon asiaa (liikaa?). Kaikkea ei ehdi. Valitse kattava ohjelma kustakin tunnin osa-alueesta, jotka ovat:

Aloitus
Yksilöllinen kokeilu
Parityöskentely
Leikki tai peli
Lopetus

Kaikkia tehtäviä kokeillaan useampaan kertaan. Parityöskentelyssä korostetaan toisen kannustamista ja auttamista. Leikin tai pelin voi valita (usein annettu kaksi vaihtoehtoa). Leikeissä korostetaan yhteistoimintaa.

Tunneilla tulisi olla yksi isohko pallo/lapsi (voimistelupallo, lentopallo)

Muita suositeltavia palloja ovat kori-, kenko-, pehmo- ja tennispallot.

Elävöitä ja tee haastavammaksi (varsinkin Kaikuharjussa, jossa sali koko ja lattia voi rajoittaa tehtävien suorittamista, pomp-paako pallo judotatamalla?)

- vaihtamalla suuntia eteenpäin, taaksepäin, sivulle
- muuttamalla liikkumistapaa; kävellen, juosten, tasahypyin, kinkaten
- käyttämällä eri tasoja; maaten, istuen, polvinseisonnassa, seisten
- vaihtelemalla pallon kokoa

Muita tarvittavia välineitä ovat; hernepussit, joustinnaaru(taikanaru), pelkkis- tai pingismailat.

Salissa tulisi olla seinäpinta-alaa pallottelua varten.

Tunnin toteutumisesta tulisi pitää päiväkirjaa; mitä tehtiin, mikä jäi pois kokonaan.