Palacky University in Olomouc

Faculty of Physical Culture

MASTER THESIS

2011 Milica Duronjić

Palacky University in Olomouc

Faculty of Physical Culture

EFFECTS OF INTERVENTION AND HOLIDAY ON MOTOR SKILLS DEVELOPMENT OF PRESCHOOLERS WITH AUTISM SPECTRUM DISORDER

(CASE STUDIES)

Author: Milica Duronjić

Promoter: prof. PhDr. Hana Válková, CSc.

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Author's first name and surname: Milica Duronjić

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Abstract: The purpose of the present study was to assess motor skill performance of preschoolers with autism spectrum disorder, who were involved in the intervention program. Participants included 4 male children, 66 to 79 months old, who were attending the same special kindergarten. Both quantitative and qualitative aspects of their performance were examined. With regards to quantitative examination participants were measured with the test of Movement Assessment Battery for Children (Henderson & Sugden, 1992). Qualitative results were obtained through personal observation. Motor skill intervention program last eight weeks, and children were tested three times, pre and post intervention and after tree months again. Over the course of the intervention, the four participants improved their motor skills and after the three months without intervention all children decreased their level of motor skills. This study concluded that if preschool children with autism would be involved in a systematic physical activity at least twice a week during the whole year, they would improve their motor and social skills which would help them in their future development.

Keywords: Intellectual disability, Motor development, Autism Spectrum Disorder, Movement Assessment Battery for Children (M-ABC), Early intervention.

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Jméno a příjmení autora: Milica Duronjić

Název diplomové práce: Učinky prázdnin na rozvoj pohybových dovedností v předškolním věku s poruchom autistickeho spektra (případové studie).

Fakulta tělesné výchovy, Palacky Univesita v Olomouc

Vedoucí diplomové práce: prof. PhDr. Hana Válková, CSc.

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Abstrakt: Účelem předložené studie bylo zhodnotit motorické dovednosti předškolních dětí s poruchami v autistickém spektru po osmitýdenním intervenčním programu. Experimentu se zúčastnilo 5 dětí, 4 chlapci a 1 dívka ve věku od 62 do 81 měsíců. Všichni navštěvovali stejnou speciální mateřskou školu. Šetření zahrnovalo jak kvantitativní, tak kvalitativní aspekty. Kvantitativní data účastníků byla měřena testem MABC (Baterie motorického vyšetření dětí) podle Henderson & Sugden, 1992), zatímco kvalitativní data byla získána pozorováním. Intervenční pohybový program trval osm týdnů a děti byly měřeny 3 krat před a po intervenci, po prázdnninách. Čtyři děti po programu vykazovaly zlepšení dovedností, jedno dítě nikoliv. Studie uzavírá, že děti s poruchou v autistickém spektru mohou dosáhnout zlepšení v motorických i sociálních dovednostech, pokud jsou zařazeny do intervenčního pohybového programu minimálně dvakrát týdně, což prospívá jejich budoucímu vývoji.

Klíčová slova: mentální postižení, motorický rozvoj, porucha v autistickém spektru, M-ABC (Baterie motorického vyšetření dětí), ranná intervence.

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Lastly, I offer my regards to all of those who supported me in any respect during the completion of the project.

Declaration

I hereby declare that I have completed this Master thesis independently under the supervision of prof. PhDr. Hana Válková, CSc. I have provided all literal sources and met all principles of scientific ethics.

In Olomouc, January 2011. ……

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1 INTRODUCTION

Children with Autism Spectrum Disorder (ASD) may be at risk for being physically inactive because characteristics of the disability interfere with successful participation in traditional forms of physical activity (Fox & Riddoch, 2000).

Children with ASD demonstrate:

- restricted, repetitive, and stereotyped patterns of behavior, interests, and activities
- qualitative impairments in social interaction
- qualitative impairments in communication (American Psychiatric Association, 2000)

These impairments may interfere with a variety of physical activity opportunities, such as riding a bike to school without supervision of playing tag with peers during recess.

The health benefits of participating in adequate amounts of physical activity and the fact that health behaviors are established during childhood are well documented (Raitakari et al., 1994). It is recommended that children engage in more than 60 minutes and up to several hours of moderate to vigorous physical activity per day, 10 to 15 minutes or more in duration (Corbin & Pangrazi, 1999), but it is unclear whether children with ASD are meeting these guidelines.

Since impairments associated with the disability may place individuals with ASD at risk for inactivity, addressing positive physical activity habits early in life could contribute to regular participation in physical activity, which leads to enjoyment of health benefits and contributes to maximal community participation as an adult.

Taking into consideration the importance of motor skills, as well as, the problems that a delay in their development can result to, the necessity for early intervention is clearly demonstrated. (Samouilidu & Valkova, 2006). This is also supported by a large number of studies (Casto & White, 1984; Cowden, Sayers, & Torrey, 1998; Guralinick, 1991; Odom, 1988; Orr, 1990; Sayers, Cowden, Newton, Warren, & Eason, 1996; Stedman, 1988; White & Casto, 1985).

In this study we will focus manly on an ability of children with autism spectrum disorders; to participate in physical activity intervention, the probability of measurement, validity of test battery and changes that will occur over the course of the intervention.

2 LITERATURE REVIEW

Key Words: Motor development, Intellectual disability, Autism Spectrum Disorder, Movement Assessment Battery for Children (M-ABC), Early intervention.

2.1 Motor Skills Development

2.1.1 Definition of Motor Development

Fundamental Movement Skills are the basic movements that involve the combination of movement patterns of two or more body segments (Gallahue, 1996). The three categories of fundamental movement skills are:

- Locomotor movements - movements in which the body is propelled from one point to another. Examples include walking, running, leaping, hopping, jumping, galloping, sliding and skipping.
- Non-locomotor movements - stability movements in which the axis of the body revolves around a fixed point. Examples include bending, stretching, twisting, turning, lifting and falling.
- Manipulative movements - movements in which force is imparted to or received from objects. Examples include throwing, catching, kicking, trapping, rolling, dribbling, striking and volleying.

Fundamental motor skills are commonly considered the building blocks to more advanced movement skills and specific sport skills (Burton & Miller, 1998; Haywood & Getchell, 2002; Payne & Isaacs, 2002; Seefeldt, 1980). Fundamental motor skills help children control their bodies, manipulate their environment, and form complex skills and movement patterns involved in sports and other recreational activities (Davis & Burton, 1991; Payne & Isaacs, 2002; Seefeldt, 1980). Fundamental motor skills do not simply develop as a result of age; they must be instructed and practiced (Haywood & Getchell, 2002; Payne & Isaacs, 2002). From dynamic systems theoretical perspective, fundamental motor skills do not naturally "emerge" during early

childhood; rather, they are the result of many cooperating subsystems influencing a child's motor skill development (Newell, 1984, 1986; Thelen, 1995). Children who are at risk of developmental delay have been found to demonstrate developmental delays in fundamental motor skills development (Connor-Kuntz & Dummer, 1996; Goodway & Rudisill, 1999; Hamilton, Goodway, & Haubenstricker, 1999). There is an emerging literature base to show the positive effects of early motor skill programs on motor skill development for young children, including those who are at risk (Connor-Kuntz & Dummer, 1996; Hamilton at al., 1999; Kelly, Daggre, & Walkey, 1989; Miller, 1978; Valentine, 1997; Zittel & McCubbin, 1996). Instructional programs as short as eight weeks and encompassing (a) direct instruction (Connor-Kuntz & Dummer, 1996; Kelly et al., 1989), (b) more indirect child-centered approaches (Valentini, 1997), and (c) parents as teachers (Hamilton et. al, 1999) have all yielded positive changes in motor skill development. These interventions have used variety of instructional approaches to bring about change in motor skill development.

2.1.2 Determinants of Motor Skills Development

Newell (1986) outlined the following three types of constraints on motor development:
Major periods of Motor Skills Development:

Organism constraints: Constraints that arise within the organism include structural and functional constraints. Structural constraints refer to aspects of the individual's physical being such as the body size and shape. Functional constraints refer to the physiological state of the body's system, including the nervous and cardiovascular systems. For example, balance is an organism constraint that at first prevents a toddler from walking, then leads to a constrained walking pattern with arms out to the side, a wide base of support, and short steps. Eventually as balance improves we see a shift to a more adult-like walking pattern.

Environmental constraints: Environmental constraints arise outside the organism. Constraints in the physical environment would include such factors as gravity, ambient temperature**,** ambient temperature, available light, and the supporting surface. ‘’Changing the

environment changed the behavior''. For example, shifts in geographical location on earth change the impact of gravity on the performer, in addition to the natural ambient temperature and light. Extreme changes in the influence of gravity in the influence of gravity on performance occur when moving an individual to a space vehicle or submerging him in water (Newell, 1986).

Task constraints: Are those requirements of the specific task or purpose that the mover seeks to accomplish. Task constraints are found not only in the movement's goal, but also in the tools or equipment of the task. An interesting example of the significance of the interpretation of task constraints occurred many years ago in the swimming event of breaststroke. One of the rules (task constraints), indicated that the legs and arms should be moved simultaneously and symmetrically. The rule, however, did not mention whether the arms and legs could be brought out of the water. A swimmer in the 1930's recognised that increased power could gained from an out of the water arm and leg recovery and the butterfly stroke was born (Wallechinsky, 1984). Indeed, in the breaststroke final, event swam the butterfly stroke. World records for the breaststroke event were broken frequently as a consequence of this technique change. After the Helsinki games, the administrators of the swimming associations separated the breaststroke and butterfly events. In doing so, they effectively specified different task constraints for the two events. This example reflects how the performer's interpretation of the task constraints can influence the pattern of coordination
produced (Newell, 1986).

2.1.3 Preschool children and motor skills development

The preschool period, age two to six, is another exciting time in the developmental process of the young. During this time frame, children build upon and expand their walking ability into a variety of other locomotors activities. The foundation for the later refinement of manipulative skills, throwing, catching, and striking, is also established in the early childhood years. Social interaction becomes more complex, with the preschool child engaging in a variety of simple games. (Dunn & Leitschuh, 2006).

Biological growth and development of children, their motor, intellectual and emotional development, their behavior, social, physical and other activities, it is necessary to measure, assess, monitor, control, and through teaching and training process corrected. This is particularly important in preschool children, when their body is under various influences, and whose effects are manifested in the later period. (Popović, 2008).

Children who learn to be successful movers during their childhood are likely to become active movers throughout their lives. (McCall & Craft, 2000).

According to Eichstaedt and Lavay (1992), preschool age is crucial for the development of motor skills. In the age of 4 running skill has greatly improved over the past year, and most of this is attributed to increased leg-muscle strength, balance, and overall body coordination. When observing their running patterns, one is aware these children can run smoothly, even when changing speeds. They start turn and stop quickly. With regards to appropriate activities for this age, they should include a wide variety of climbing, balancing, pulling and pushing and crawling over and under objects (Eichstaedt & Lavay, 1992).

2.2 Intellectual Disability

2.2.1 Definition

Intellectual disability is generally described in broad terms, i.e. a disability which started before adulthood; reduced ability to cope independently due to a reduced ability to understand new information and learn new skills (Burton, 1997). According to Luckasson, et al (1992), mental disability refers to substantial limitations in present functioning. It is characterized by significantly subaverage intellectual functioning existing concurrently with related limitations in two or more of aplicable adaptive skill areas: communication, self-care, home-living, social skills, community use, self-direction, health and safety, functional academics, leisure and work. Mental disability manifests before age 18.

Regarding to American Association on Intellectual and Developmental Disabilities (AAIDD): Intellectual disability is a disability characterized by significant limitations both in intellectual functioning and in adaptive behavior, which covers many everyday social and practical skills. This disability originates before the age of 18.

2.2.2 Classification

The World Health Organization's (WHO) International Classification of Diseases (ICD) (2001), and the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (2000) use intelligence test scores to determine the level of severity of intellectual disabilities (Winnick, 2005).

ICD-10-CM - International Statistical Classification of Diseases and Related Health

Problems (10th ed.). (World Health Organization, 2006).

Mental retardation (F70-F79).

.0 With the statement of no, or minimal, impairment of behavior

.1 Significant impairment of behavior requiring attention or treatment

.8 Other impairments of behavior

.9 Without mention of impairment of behavior

F70 Mild Mental retardation:

Approximate IQ range of 50 to 69 (in adults, mental age from 9 to under 12 years). Likely to result in some learning difficulties in school. Many adults will be able to work and maintain good social relationships and contribute to society.

F71 Moderate Intellectual disability:

Approximate IQ range of 35 to 49 (in adults, mental age from 6 to under 9 years). Likely to result in marked developmental delays in childhood, but most can learn to develop some degree of independence in self-care and acquire adequate communication and academic skills. Adults will need varying degrees of support to live and work in the community.

F72 Severe Intellectual disability:

Approximate IQ of 20 to 34 ((in adults, mental age from 3 to fewer than 6 years). Likely to result in continuous need of support.

F73 Profound: Intellectual disability:

IQ under 20 (in adults, mental age below 3 years). Results in severe limitation in self-care, continence, communication, and mobility.

2.2.3 Epidemiology

Intellectual disability affects 1- 3 % of the population (THENAPA, 2004). Individuals with Intellectual disability constitute the 3rd largest population of persons with disabilities that follow special education (Luckasson, 1992).

2.2.4 Etiology of Intellectual Disability

Internal:

- Genetic
- Heredity

External - obtained during life.

Biomedical: factors that relate to biologic processes, such as genetic disorders or nutrition (chromosomal disorders, single-gene disorders, cerebral dysgenesis, parental age, birth injury). Genetic disorders are transmitted to the child through genes at the time of conception. The most frequent disorders are fragile X syndrome, phenylketonuria, tuberous sclerosis or Bourneville's disease, and Lesch-Nyhan syndrome.

Chromosomal disorders occur during the arrangement of chromosomes. The most common of these disorders are Down syndrome, Prader-Willi syndrome, and Angelman syndrome.

Social: factors that relate to social and family interaction, such as stimulation and adult responsiveness (poverty, maternal malnutrition, domestic violence, lack of access to prenatal care, lack of access to birth care).

Environmental: causes are those factors that can be controlled, such as dietary deficiencies in the mother during pregnancy, consumption of drugs or alcohol, lack of physical and sensory stimulation and absence of health care.

Educational: factors that relate to the availability of educational supports that promote mental development and the development of adaptive skills (parental cognitive disability without supports, impaired parenting, delayed diagnosis, inadequate family support). (AAMR, 2002).

2.2.5 Intellectual Disability and Motor skills Development

Researchers are in agreement that person with Intellectual disability (ID) display low motor performance scores (Holland, 1987; Eichstaedt & Lavay, 1992; Block, 1993). Traditionally, professionals have believed that children with mild ID are 2 to 4 years behind non-intellectually disabled measures of motor performance. This belief is based on the pioneer research of Rarick (1911-1995), who published extensively in the area of ID and motor behavior (Sherrill, 2003). More recently, Auxter, Pyfer and Huettig (2005) stated that motor delays are very common among persons who are severely mentally retarded. Generally, the greater the intellectual disability is, the greater the lag in attaining major developmental milestones (Winnick, 2005).

Auxter et al., (2005) reported that: 'Delays in developing postural reflexes impact the ability to perform such basic tasks as grasping objects, holding the head up, sitting, standing, and walking. In addition, these delays, to varying degrees, negatively impact their motor and physical capabilities. They may be less capable in strength, flexibility, agility, coordination, and balance'. DiRocco, Clark, and Phillips, (1987) examined the developmental sequence of coordination for the propulsive phase of the standing long jump. The 39 mildly mentally retarded children (4 to 7 years old), who composed the experimental group, were compared to 90 same aged without disability children, who composed the control group. Each subject was filmed performing several standing long jumps. In spite the fact that the age group means for the distance jumped by the mentally retarded subjects were 2 to 3 years behind their without disability peers, the coordination patters were found to be similar.

The delay in motor development of the ID children carries over to the early childhood years where these children are well behind intellectually normal children in the acquisition of fine motor skills and such childhood skills as hopping, skipping, and galloping (Rarick, n.d). For example, a study conducted by Rarick and Dobbins (1977) determined that boys with moderate ID displayed lower performance accuracy scores on two throwing tasks when compared to non-disabled boys of a similar chronological age.

With regards to this developmental delay, several possible explanations have been reported. Ersing, Loovis, and Ryan, (1982) stated that 'in any discussion of factors affecting normal motor development, several are obvious by their frequent reference in the literature. In general these factors include size, physique, rate of maturation, child rearing practices, socioeconomic level and maturation'. When one adds to this list poor health, abnormal reflex response, slowness in reaction time, a lack of movement opportunities and experiences, and a luck of quality instruction (Rarick, 1973) it is obvious that a combination of factors must be taken into consideration when trying to explain this population's movement deficiencies (Eichstaedt & Lavay, 1992).

Davis (1987) believes that to better determine reasons for movement deficiencies in this population, the physiological descriptive level of persons with ID should also be examined. According to Sherrill (2003) some differences in motor performance between person with and without ID can be explained by height and body composition'.

Eckert (1987) referring to the age of 5, mentioned that large-muscle basic motor skills are acquired, increased balance development allows for increased range of movement executing a skill, while manipulative skills need refinement. In this stage of development, fine and gross muscle control, as well as overall body coordination, is improving rapidly. Additionally, striking and kicking should be encouraged (Eichstaedt & Lavay, 1992). Auxter et al., (2005) stated that between 48 and 60 months a child 'walks downstairs alternating feet; walks to an even beat in music; jumps forward ten times consecutively; hops on non-preferred foot; catches using hands only; gallops with one foot leading; slides in one direction; throws contra laterally; swings on a swing and self propels'.

Finally, in the age of 6, major locomotors skills, such as walking, running, jumping, and stair climbing are now easily performed. Children are able to participate in a variety of sports such as cycling, swimming, and skiing. The more complex locomotors skills of galloping and skipping should be included in individual drills and low-organized games (Eichstaedt & Lavay, 1992). Regarding these skills, Auxter et al., (2005) reported that a child in the age of 6 is able to gallop with either foot leading, may skip, and also bounce and catch a tennis ball. Striking should be encouraged, and included in activities (Eichstaedt & Lavay, 1992).

Preschool children build and expand upon earlier development and establish the foundation for later refinement of locomotors and manipulative skills. This period, with its relatively uniform process of growth, allows for a great deal of movement exploration. (Dunn & Leitschuh, 2006).

2.3 Pervasive Developmental Disorders

Pervasive developmental disorders (PDD) is a broad diagnostic category for severe impairment in reciprocal social interaction or communication skills and/or the presence of stereotyped behavior, interests and activities (Sherrill, 2003). In general, children who have a type of PDD have difficulty in communicating, playing with other children, and relating to others, including their families (Auxter et al., 2005). Recently, many persons are using the term 'autism spectrum disorder, instead of PDD (Reid & Collier, 2002; 2003).

2.3.1 Autism Spectrum Disorder (ASD)

Autism is a rare disorder in which children fail to develop the ability to relate and interact with people. They tend to be lost in their own world and remain indifferent to people around them. They have poor eye contact. They may develop some limited speech, but fail to use it for communicating with others. They tend to spend most of their time repeating the same activities again and again. The main form of treatment for autism is behavioral training to improve social, communicative, and self-help skills. (World Health Organization, 2006).

In research by Gillberg and Wing from 1999, they reported that on 10,000 children born 9.6 will be autistic. The word Autism means "absorbed in the self" (Berk, 2000, p. 446)

Autism is a developmental disability that affects a person's ability to communicate, understand language, play, and interact with others (Dunlap & Bunton-Pierce,1999). It is a neurobiological condition, where children experience life-long pervasive difficulties with social interaction and communication, and demonstrate restricted and repetitive behaviors. The broader spectrum around Autism includes individuals across a range of severities, language and intellectual

abilities. Autistic children usually show impairment in communication, in social interaction and express repetitive and stereotyped patterns of behavior (American Psychiatric Association, 1994; Dunlap & Bunton-Pierce, 1999; Powers, 2000; Winnick, 2005). In physical aspect, children with autism may also exhibit physical over-activity and uneven of gross and fine motor performance (Autism Society of America, 2006), lack of cooperative in group play as well as motor planning and coordination disorder (National Education Association, 2006). Autism is a condition in which there is primary impairment of social communication. Autism is a *spectrum disorder* which means the symptoms can vary in severity (Autism Society of America, 2006; Powers, 2000; Shore, 2001). Some autistic children may be very passive and compliant, can be violent, and may be withdrawn and anti-social though some may feel comfortable in social situations (Shore, 2001). According to Dunlap and Bunton- Pierce (1999), children with autism can cognitively range from having mental retardation to having significantly high intelligence levels, or even being label gifted. This wide range of severity is an indication that there is a vast opportunity for autistic children to involve in social, emotional, physical and cognitive activities into their daily living. Research is needed to further understand the undisclosed knowledge related to autism children from the perspective of the physical and motor skill. Assessment on motor skills has been conducted to evaluate their severity as the incidence of motor planning and coordination disorder occur among autistic children. With the increasing numbers of children in public education environments diagnosed with autism, educational professionals must be attuned to the specific developmental needs of these children and their learning requirements. Children with autism face many difficulties. These difficulties can be both academic and behavioral, but all are underscored by communication deficits. Educators must be attuned to the developmental levels of all of the children they teach. Autistic 'aloneness' and lack of interest in affective contact with others appears very early in life, and it appears that autistic persons' biologically based impairments in social-affective relatedness may underlie what Hob-son (p. 204) calls 'their limited intellectual (cognitive) grasp of other persons as persons with their own mental life'. The shared or joint attention behavior outlined above is reported to be missing in the development of even quite able autistic children. For Autistic people find it difficult to make direct eye contact with others, to hold another's gaze. This can improve with age, but requires conscious effort and training. Autistic children have difficulties with reciprocal social play. Their play is object-orientated, and they are often felt to treat people as furniture. One mother writes of her autistic

child 'There was no "connection" with other human beings. I seemed no more important to him than a chair. He used my hand to pull open the refrigerator door for juice, as though the rest of me was just an unimportant accessory to the hand. Autism is now popularly thought of as a spectrum of conditions united by difficulties in social interaction, pragmatic language, and repetitive behaviors or obsessive interests. The word spectrum has usually been used in psychiatry to suggest that all the components are conceptually and etiologically related but that they differ in severity. According to National Institute of Neurological disorders and stroke, typical characteristics of ASD are:

- Insistence on sameness; resistance to change
- Difficulty in expressing needs; using gestures or pointing instead of words
- Repeating words or phrases in place of normal, responsive language
- Laughing (and/or crying) for no apparent reason; showing distress for reasons not apparent to others
- Preference to being alone; aloof manner
- Tantrums
- Difficulty in mixing with others
- Not wanting to cuddle or be cuddled
- Little or no eye contact
- Unresponsive to normal teaching methods
- Sustained odd play
- Spinning objects
- Obsessive attachment to objects
- Apparent over-sensitivity or under-sensitivity to pain
- No real fears of danger
- Noticeable physical over-activity or extreme under-activity
- Uneven gross/fine motor skills
- Non-responsive to verbal cues; acts as if deaf, although hearing tests are in normal range

http://www.autism-society.org/site/PageServer?pagename=about_whatis_char

But what still remains unknown is what causes autism. There are some researches but they are still on a premature stage. Most likely is a genetically caused (family history) neurological (brain) disorder: a) chromosomal defects, b) disorders of neuron cell migration, c) congenital brain malformation, or d) electrophysiological abnormalities
(National Institute of Neurological disorders and stroke, April 2006)

2.3.2 Types of Autism Spectrum Disorder

The three types of autism that we are interested in are the following (World Health Organization, 2007):

Childhood autism (F 84.0):

A type of PDD that is defined by: (a) the presence of abnormal or impaired development that is manifest before the age of three years, and (b) the characteristic type of abnormal functioning in all the three areas of psychopathology: reciprocal social interaction, communication, and restricted, stereotyped, repetitive behavior. In addition to these specific diagnostic features, a range of other non-specific problems are common, such as phobias, sleeping and eating disturbances, temper tantrums, and (self-directed) aggression (ICD, 2007).

Atypical autism (F 84.1):

A type of pervasive developmental disorder that differs from childhood autism either in age of onset or in failing to fulfill all three sets of diagnostic criteria. This subcategory should be used when there is abnormal and impaired development that is present only after age three years, and a lack of sufficient demonstrable abnormalities in one or two of the three areas of psychopathology required for the diagnosis of autism (namely, reciprocal social interactions, communication, and restricted, stereotyped, repetitive behavior) in spite of characteristic abnormalities in the other area(s). Atypical autism arises most often in profoundly retarded individuals and in individuals with a severe specific developmental disorder of receptive language.

Asperger's syndrome (F 84.5):

A disorder that is characterized by the same type of qualitative abnormalities of reciprocal social interaction that typify autism, together with a restricted, stereotyped, repetitive repertoire of interests and activities. It differs from autism primarily in the fact that there is no general delay or retardation in language or in cognitive development. This disorder is often associated with marked clumsiness. There is a strong tendency for the abnormalities to persist into adolescence and adult life. Psychotic episodes occasionally occur in early adult life.

2.3.3 Common characteristics for children with Autism Spectrum Disorder

Each individual with an autism spectrum disorder (ASD) is unique and may demonstrate different behaviors and skills. The following information provides an overview of some of the common characteristics seen in children with ASD.

Social interaction: They don't have interests in making friends, they prefer to be alone rather then with the others, and problem with eye contact or smiles.

Communication: Not develop language or is it developing slowly, they communicate with gestures instead of words.

Sensory Differences: The child with ASD may not react the same way to a different environmental stimuli. May have impairment in sight, hearing touch, smell and taste to a greater or lesser degree.

Play: A child with ASD may not begin play with other children. The child prefers to play alone. There is a lack of imitations of other children's or adult's actions.

Behaviors: They can be hyperactive or passive, and may show aggression to others or to themselves, and they often have difficulty with changes in routine. (www.autismsociety-nc.org)

2.3.4 Diagnostic Criteria For Autistic Disorder

The following criterions are from the 2000 Revision of the Diagnostic and Statistical Manual, Fourth Edition, Text Revision (DSM-IV-TR). See the DSM-IV-TR manual for details and examples.

1. A total of Six (or more) items from (1), (2), and (3), with at least two from (1), and one each from (2) and (3).
2. qualitative impairment in social interaction, as manifested by at least two of the following:
    a. marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction
    b. failure to develop peer relationships appropriate to development level
    c. a lack of spontaneous seeking to share enjoyment, interest, or achievements with other people (e.g., by a lack of showing, bringing, or pointing out objects of interest)
    d. lack of social or emotional reciprocity

qualitative impairments in communication as manifested by at least one of the following:

. delay in, or total lack of, the development of spoken language (not accompanied by an attempt to compensate through alterative modes of communication such as gesture or mine)
    a. in individuals with adequate speech, marked impairment in the ability to initiate or sustain a conversation with others
    b. stereotyped and repetitive use of language or idiosyncratic language
    c. lack of varied, spontaneous make-believe play or social imitative play appropriate to developmental level

restricted repetitive and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following:

. encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus

a. apparently inflexible adherence to specific, nonfunctional routines or rituals
b. stereotypes and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole-body movements)
c. persistent preoccupation with parts of objects

A. Delays or abnormal functioning in at least one of the following areas, with onset prior to age 3 years: (1) social interaction, (2) language as used in social communication, or (3) symbolic or imaginative play.

B. The disturbance is not better accounted for by Rett's Disorder or Childhood Disintergrative Disorder

(American Psychiatric Association. (2000). Diagnostic criteria for autistic disorder. In Diagnostic and statistical manual of mental disorders (Fourth edition---text revision (DSM-IV-TR). Washington, DC: American Psychiatric Association, 75.)

2.3.5 **Diagnosis of ASD**

Autism varies widely in its severity and symptoms and may go unrecognized, especially in mildly affected children or when it is masked by more debilitating handicaps (NINDS, 2006). Doctors rely on a core group of behaviors to alert them to the possibility of a diagnosis of autism. These behaviors are:

- Impaired ability to make friends with peers
- Impaired ability to initiate or sustain a conversation with others
- Absence or impairment of imaginative and social play
- Stereotyped, repetitive, or unusual use of language
- Restricted patterns of interest that are abnormal in intensity or focus
- Preoccupation with certain objects or subjects
- Inflexible adherence to specific routines or rituals (NINDS, 2006).

Medical doctors will often use a questionnaire or other screening instrument to gather information about a child's development and behavior. Some screening instruments rely solely on parent observations; others rely on a combination of parent and medical doctor observations. If screening instruments indicate the possibility of autism, doctors will ask for a more comprehensive evaluation (NINDS, 2006).

Autism is a complex disorder. A comprehensive evaluation requires a multidisciplinary team including a psychologist, neurologist, psychiatrist, speech therapist, and other professionals who diagnose children with ASDs. The team members will conduct a thorough neurological assessment and in-depth cognitive and language testing. Because hearing problems can cause behaviors that could be mistaken for autism, children with delayed speech development should also have their hearing test. After a thorough evaluation, the team usually meets with parents to explain the results of the evaluation and present the diagnosis. Children with some symptoms of autism, but not enough to be diagnosed with classical autism are often diagnosed with PDD-NOS. children with autistic behaviors but well-developed language skills are often diagnosed with Asperger syndrome. Children who develop normally and then suddenly deteriorate between the ages of 3 to 10 years and show marked autistic behaviors may be diagnosed with childhood disintegrative disorder. (NINDS, 2006).

2.4 Autistic children and Assessment of Motor Skills

Assessment is very important when teaching children, but it may be difficult working with children with disability. There are some children with disability who are good at physical and motor skills, but on the other hand majority has problems with physical and motor skills. For these students learning motor skills is very hard and time consuming. (Block, Kelly & Horvat, 2007)

They learn slower and it can be quite frustrating for them, comparing peers. As result they may give up when they see that they are not successful, and it can be right after first try, it means that they have low tolerance of failure. Once they give up it's very hard for teacher to motivate again. The key to avoid failure is assessment. (Block, Kelly & Horvat, 2007).

There are a several different ways to measure children's performance of fundamental motor skills, each with advantages and disadvantages. The assessor must take these into consideration when deciding what approach to take. The decision on how to measure children's FMS performance will be guided by the purpose of assessment. What information is needed and why? The purpose may be to appropriately group a class of children, to identify those at risk, to plan intervention or educational programs, to monitor change over time, to provide feedback to the performer or to predict performance in the future (Burton & Miller, 1998).

2.4.1 Developmental Disorders and Motor skill development

With regards to Autism, Manjiviona and Prior (1995), found that 66,7% of children with autism have definite motor problems as measured on the Test of Motor Impairment-Henderson revised, and performed at a level significantly lower than their same age peers. Same evidence was reported by Berkeley et al., (2001). In this study 15 autistic children, ages 6 to 8 years were examined in locomotor and object control skills. Comparing their scores with the norms reported by Ulrich (1985) for the Test of Gross Motor Development (TGMD), overall fundamental skill delays were demonstrated by 73% of all participants, placing them in the poor and very poor TGMD performance categories. According to Auxter et al., (2005) learners with autism may exhibit gross and fine motor delays, as well as, unusual gross and

fine motor behaviours. Motor clumsiness is another typical characteristic of children with autism (Berkeley et al., 2001; Reid & Collier, 2002).

Nevertheless, motor clumsiness is also often observed in individuals with Asperger's disorder (APA, 2000). Children with Asperger's syndrome like children with 'high functioning' autism, may perform basic locomotor patterns with ease-like walking, running, and climbing stairs. However they may struggle with gross motor skills that require the learner to adjust the timing, sequence, speed or direction of the movement (Rinner, 2001-2002).

Measurements on a group (*n*=59) of 4-year-old children who were identified as at risk for developmental delays, reported a low level on locomotor and object-control skills, as measured by TGMD (Goodway & Branta, 2003). Object-control skills were measured also in a research conducted by Hamilton, Goodway, & Hanbenstricker (1999).The participants, 15 preschoolers (3 to 5 years old), at risk for developmental delay or academic failure, performed in the lower 20th percentile of the object-control subscale of TGMD.

2.4.2 Movement Assessment Battery for Children (M-ABC)

(Henderson & Sugden, 1992)

The assessment of movement skill is a critical component of many disciplines and professions. Although the specific contexts and applications may vary, the basic concepts and strategies are similar. In order to plan efficient and effective movement programs or to support the involvement of a child with special needs in the wider community, it is important to gather information about the motor skill level of the child and what best motivates them, their strengths and needs.

MABC is a well known tool regarding movement skill assessment in young children. It has been used in numerous studies, with different populations and in different places of the world.

The M-ABC is a clinical assessment used to determine the extent of impairment in fine and gross motor skills. It includes eight items divided into three subtests; manual dexterity, ball skills, and static and dynamic balance; the tests are also divided into four age bands, with children undertaking

different activities depending on their age. One of the four test age bands, corresponding to developmental attainments of children aged 4 - 6 years (n=5) was used in the present study. M-ABC scores range from 0 to 5, with 5 indicating the highest level of impairment. Scores of 0 are achieved by 75% of the normative sample, and scores of 5 by the lowest 2%. A total impairment score is obtained from the sum of subsections and may then be converted to a percentile rank. A raw score of 0 to 9.5 is considered to be within the average range, a score of 10 to 13.5 (5th–15th percentile) is considered borderline, and scores of more than 13.5 (<5th percentile) are indicative of definite motor difficulties. Percentile cut-offs (15% and 5%) for the three subtests are also reported.

The total impairment score of the M-ABC is a reliable measure for identification of mild to moderate motor impairment in young children. Repeated testing on the M-ABC at intervals of three weeks results in a systematic measurement error and is not recommended. The SEM is substantial. Follow-up of preschool children with the M-ABC as a single outcome measure is not appropriate. (Van Waelvelde, Peersman, Lenoir and Engelsman, 2007).

According to Van Waelveld et.al, 2007,

- The total Movement Assessment Battery for Children score is reliable for identification of preschool children with mild to moderate motor impairment.
- Follow-up of preschool children with the Movement Assessment Battery for Children should be viewed as part of a comprehensive assessment.
- Frequent testing of preschool children results in improved test performance and should be Avoided.

One of the cases that MABC has been extensively used is in studies measuring children with D.D, as developmental coordination disorder (Pless, Carlsson, Sundelin, & Persson, 2002; Rodger, Ziviani, Watter, Ozanne, Woodyatt, & Springfield, E., 2003; Smits-Engelsman, Niemeijer, & van Galen, G.P., 2001; Jongmans, Smits-Engelsman, & Schoemaker, 2003; Crawford, Wilson, & Dewey, 2001) and attention deficit hyperactivity disorder (Pitcher, Piek, & Barrett, 2002; Pitcher, Piek, & Hay, 2003). Additionally it has been used in other research domains as in children with MR (Spano, Mercuri, Rando, Panto, Gagliano, Henderson, & Guzzetta, 1999; Brasic, Barnett, Kowalik, Tsaltas, & Ahmad, 2004), in children born very prematurely (Cooke, 2005; Westrup, Bohm, Lagercrantz, & Stjernqvist, 2004; Chaudhari, Otiv, Chitale, Pandit, & Hoge, 2004), as well as in children without disabilities (Van Waelvelde, De

Weerdt, De Cock, & Smits-Engelsman, 2003; Pedersen, Sigmundsson, Whiting, & Ingvaldsen, 2003; Brake & Bornholt, 2004).

2.5 Early Intervention and Physical Activity

Intervention should begin as early as possible in the child's life, (optimally between 2 and 4 years) (Prior & Roberts, 2006). A limited number of studies have documented that carefully planned interventions can help children acquire motor skills in early childhood (Goodway-Shiebler, 1994; Kelly, Dagger, & Walkley, 1989; Sayers et al., 1996; Zittler & McCubbin, 1996). In a study of 59 preschool children enrolled in an at-risk prekindergarten program, Goodway-Shiebler (1994) reported significant gains in fundamental motor skills following a 12-week, teacher-directed motor skill intervention. Pretest and posttest data were collected using the Test of Gross Motor Development (TGMD) of Ulrich (1985). Over the course of the intervention, the experimental group (n=30) improved from the 15^{th} to the 80^{th} percentile in locomotors skill performance and from the 17^{th} to the 80^{th} percentile in object-control performance. The control group demonstrated no significant gains in performance.

Kelly at al. (1989) investigated the effect of an instructional program on the motor skill acquisition of 21 typically developing preschool-aged children. Significant qualitative and quantitative gains were found on six motor skills taught to the experimental group, whereas the control group showed no significant gains in performance.

Berdychova (1969) gathered regularly parents and children aged 2 to 6 years for joint exercises. It appeared that exercise one of the parents with their child are bringing these benefits:

- Stimulates the level of interest parents and children to move and maturation of movement development according to their age and abilities.
- It deepens the emotional relationship between parents and children, and quality of life.
- Not only children are exercising, but parents as well and most of the movement are implemented directly through them.
- Meaningful activity for the mother or father and child, so they don't feel like time lost, which ensures appropriate development of child.

Sayers et al. (1996) investigated the effects of an 8-week, structured, parent-delivered motor skill intervention on the development of stepping movements of 4 infants with Down syndrome. Sayers et al. (1996) indicated that parents were able to deliver home-based instruction that increased and exceeded the children's expected rate of motor development. Although the acquisition of independent upright locomotion of infants with Down syndrome is individual, these infants clearly improved. All of the studies support the use of structured motor skill interventions to develop fundamental motor skills for preschool-aged children with or without developmental delays.

Research in motor learning has shown that children who have widely varied experiences are better able to learn new movement challenges and eventually to acquire sport skills (Schmidt, 1982). By providing children with opportunities to explore human movement, it is possible to help both boys and girls learn the principles that underlie all sport skills.

Both successes and failures are important in learning new skills. Dweck and Elliott (1983) found that being successful is important and that teachers should structure activities in which children accomplish tasks.

However, they also discovered that success alone does not build good self esteem. It is also important to build in failures in order to teach children to take responsibility for what they can control and to learn to put forth more effort when it is needed. It is also important to show children that success and failure are not the result only of effort but may be related to other factors such as ability. These experiences will teach children to make appropriate attributions for their successes and failures. Activities at which students experience success should also help them develop positive attitudes toward sports and fitness. The generally poor physical condition of children today may be linked to their lack of motivation to be active. According to the National Children and Youth Fitness Study II (Ross, Pate, Caspersen, Damberg, & Svi-lar, 1987), over 60% fall below the average standard on a composite physical fitness score, with girls generally being lower in fitness than boys. Many enjoyable activities can encourage both boys and girls to be physically fit while they learn movement skills. The key is to have everyone active (no long lines for relay races) and to provide developmentally appropriate activities.

As children grow and mature they should be involved in planning activities. Good movement challenges require children to decide when and how to use the skills they already possess. In this process, children gain control over their environment and can see evidence of their own abilities. Weiss (1987) found that, when children are actively involved in designing their own movement activities, optimal challenges are likely.

Bailey and Wolery (1992) presented critical assumptions that relate to the premise for providing early intervention services: (a) Children at risk or with disabilities have a right to specialized services to maximize their development, (b) earlier services increase optimal outcomes, and (c) a variety of services are required and an individualized approach is vital due to unique characteristics and needs of each individual and family.

2.6 Educational Interventions

Intensive educational and behavioral interventions have produced positive outcomes for children with autism. There is little supporting evidence for other kinds of programs, or for medical or drug treatment. Some drugs may help in treating particular symptoms such as agitation and aggression in some children, but none can 'cure' autism. Many families are choosing to try a variety of alternative therapies, but there is no scientific evidence that any of these can make a significant difference. (Prior & Roberts, 2006)

- **Behavioral Interventions**

Focus on application of learning theory and skill development. Use of Applied behavior Analysis (ABA)**.** The Applied Behavior Analysis (ABA) approach teaches social, motor, and verbal behaviors as well as reasoning skills (Harris & Delmolino, 2002). ABA treatment is especially useful in teaching behaviors to children with autism who may otherwise not "pick up" these behaviors on their own as other children would. The ABA approach can be used by a parent, counselor, or certified behavior analyst.

ABA uses careful behavioral observation and positive reinforcement or prompting to teach each step of a behavior (Simpson, 2001). The goal is to determine what happens to trigger a behavior, and what happens after that behavior to reinforce it. The idea is to remove these triggers and reinforces from the child's environment. New reinforces are then used to teach the child a different behavior in response to the same trigger (Jensen & Sinclair, 2002).

ABA treatment can include any of several established teaching tools: discrete trial training, incidental teaching, pivotal response training, fluency building, and verbal behavior (VB).

- **Developmental Interventions**

Developmental or relationship based interventions focus on the child's ability to form positive, meaningful relationships with other people. (Prior & Roberts, 2006)

Generally, the aims of these programs are to help children to "…attend, relate, interact, experience a range of feelings, and, ultimately, think and relate in an organized and logical manner. Developmental Interventions are also known as normalized interventions. (Prior & Roberts, 2006)

- **Therapy based Interventions**

Therapy based interventions typically focus on communication and social skill development (Speech Pathology) or sensory motor development (Occupational Therapy). Usually designed for use with other interventions. Example; Picture Exchange Communication System (PECS), Auditory Integration Training (AIT). (Prior & Roberts, 2006)

- **Combined Interventions**

These are interventions and programs which combine elements of behavioral and developmental models and take account of evolving knowledge about autism and typical development. In addition there is a tendency for these interventions to account for the characteristics of autism by building on strengths to address weaknesses. (Prior & Roberts, 2006)

There is likely to be a focus on managing the environment to facilitate learning and development. Example; TEACCH (Treatment and Education of Autistic and related Communication handicapped Children)

- **Other Interventions**

The Daily Life Therapy approach aims to support children to develop necessary daily living skills in the context of a group therapy program.

The Option Approach is a parent-mediated, home-based, child-centred program which aims to create environments in which children with autism can engage in safe and pleasurable social interactions with others (Cummins, 1988).

Music Therapy, SPELL (Structure-Positive-Empathetic-Low Arousal-Links), The Camphill Movement, The Miller Method

- **Family Based Interventions**

Parents of children with autism play a critical role in supporting their children's learning. In many programs, parents not only drive the decision making process, they take a primary role in delivering the intervention. (Prior & Roberts, 2006)

Consequently, parents require emotional support, advice, and training in working with their children. They also require access to up to date and accurate information about available treatment options and support services. (Prior & Roberts, 2006)

2.6.1 Recommendations for best practice in Early Intervention

All children on entering intervention programs should have had a comprehensive, multidisciplinary diagnostic assessment from an interdisciplinary team of experienced clinicians and based on national and internationally agreed criteria. Diagnostic evaluations should include; interviews with parents/care givers to review the child's developmental history, family history, previous assessments and interventions; collection of information from all professionals involved in the care of the child; pediatric, psychological, and speech pathology examinations to assess communication, relevant health conditions including motor skills, vision, and hearing, and any

associated problems such as intellectual disability and anxiety. Direct observation of the child is important in the assessment of cognitive, social, and communicative (verbal & nonverbal), fine and gross motor, and adaptive functioning using both standardized tests and informal procedures. The assessment should detail the child and family strengths and areas of need, to guide the development of intervention and management plans. With very young children, re-assessment and review within a year is desirable, since behavior may change and the effects of intervention need to be monitored. Recommendations from the assessment, and implications for intervention support should be combined in a comprehensive written report presented to the family. Contact and consultation with potential intervention program providers needs to be part of this process. Entry to an intervention program should follow as soon as possible following the assessment and diagnostic evaluation (Prior & Roberts, 2006).

The foundation for the later refinement of manipulative skills, throwing, catching, and striking, is also established in the early childhood years. Social interaction becomes more complex, with the preschool child engaging in a variety of simple games. (Dunn & Leitschuh, 2006).

AIMS AND OBJECTIVES

Aims

To identify the level of motor skills differences which has occurred in children with Autism Spectrum Disorder after three months without intervention.

Objectives

- To provide information about the level of differences of motor skills right after intervention and after three months without intervention according to MABC.
- To assess positive benefits of intervention.

Research Questions

- Did differences in motor skills levels occur over time in our sample of preschoolers with Autism Spectrum Disorder?
- Are there differences in of motor skills level after holiday?
- To what level motor skills impairment were presented in this study?

3 METHODS

3.1 The kindergarten

The children in this study are from a special public kindergarten, founded in 1991, and located in the city of Olomouc, the Czech Republic. This is a facility for children with special education needs and typically developing children. Children with autistic behavior, intellectual disability, communication and social disorders, ages 6 months to 7 years of age are served. (Samoulidu & Valkova, 2007)

The kindergarten is visited by 20 children varying in age from 3 years to 7 years old. They are educated by five teachers as well as supportive assistants (eg. students in adapted physical education or special education). Five female teachers, special education graduates who have attended additional courses relevant to the understanding of the special developmental disorders of preschoolers. The teachers have many years of experience in working with children with disabilities. The kindergarten's space is comprised of two playrooms, a dining room, a sleeping room and a locker room; a room for social events and a garden and outdoor play area. During its functioning it has participated in cooperation with other regular schools in several social activities (e.g. cinema, concerts) offered by the local educational department. Also, it often organizes outdoor activities, as well as short weekend camps for both the children and their families. There is very good cooperation between the school and parents. The motto of their curriculum: Life is our therapy. They provide detection, diagnostic, therapeutic, rehabilitative, educational, special-interest, counseling, systematic and precautionary expert assistance including inceptive care.

- individual approach
- individual program for every child
- individual form of education (one teacher teaching one child)
- teachers and parents teamwork

- system of education opened to students, authorities and public
- the implementation of the TEACCH (Treatment and Education of Autistic and Related Communication-Handicapped Children) program elements, Son-Rise method and facilitated communication for children with autistic spectrum defects respecting their individual diet
- orientation to building up a person with adequate self-determination who realizes and accepts his place in society and life
- within the framework of our free activities we offer art studio, fitness club K, Alík´s paradise and music therapy

The special teacher's team together with the parents fulfills their collective goal and that is to place every child to real life in the best possible way... (http://www.skolka-blanicka.cz/cs/o-nas).

3.2 Participants

Preschoolers were recruited based upon their participation in the physical activity intervention. In the previous intervention were 4 boys and 1 girl who were chosen following next criteria: a) diagnosis, b) age, and c) medication. Participants in new research included only 4 male because female from previous research was not attending the kindergarten anymore. All 4 male participants were diagnosed with Autism Spectrum Disorder. The age range was from 66 to 79 months old. All of them were attending the same special kindergarten. None of the children receives medication that can affect his/her motor performance. According to the interview with parents which teacher conducted, the children didn't participate in any summer camps, only maximum ten days at the sea coast with family and few weekends with grandparents at the village.

3.3 Instrument of assessment

The instrument used for assessment of motor skills of children was Movement Assessment Battery for Children (M-ABC, Henderson and Sugden, 1992). The M-ABC is designed to measure total motor impairment of motor skills that informs movement interventions). Valid and reliable motor tests are very important in identifying children with motor impairment, evaluating

motor development, and assessing efficacy of interventions. This M-ABC is developed especially to evaluate mild to moderate motor impairment. The test has a checklist (used for screening children) and a performance test. According to the authors, the test is not time consuming and children are likely to participate in the test. To assess one child with this test it takes 20 to 40 min. Included in the accompanying manual are the standardized guidelines and instructions to follow in administering this test. This ensures that the test is used in a standard way throughout the assessment and that the scores obtained can be reliably be compared to those norms obtained by Henderson and Sudgen when the battery was created in 1992. Though based on United Kingdom (UK) norms, this battery has been validated for use in many European and Asian countries. As is the nature of any motor assessment, the aim is to replicate the full ability of the child in the assessment context. Due to this, it is important to try and maintain as natural an environment as possible in order for the child to perform. This is very much the case with the M-ABC. The assessment tasks are play-like in nature and should lead to full cooperation from the child.

Each task on the M-ABC is scored in either total seconds taken to complete the task, e.g. threading beads, or counting the number of successful attempts out of total trial numbers, e.g. rolling a ball into a goal area. The M-ABC is organized into three domains or performance areas, covering manual dexterity (3 items), ball skills (2 items), static balance (1 item) and dynamic balance (2 items). A special feature of the M-ABC test is the organization in four different age bands for age groups between 4 and 12 years. Children can score between 0 and 5 on each item, so that the total score will range from 0 to 40, with increased impairment associated with higher scores. The Total Impairment Score (TIS) is the sum of all the scaled scores and this is then expressed as a percentile of the norm. For example, TIS of 13+ would indicate that the child lies in the 5th percentile, and is therefore has a very impaired score. For the purpose of this study, the performance test was used. This allows for both quantitative and comments/observations gathered and identified in this study as qualitative data. This instrument is not still translated in Czech language, so it was used in English language.

3.4 Intervention

The preschool children with Autism Spectrum Disorder were involved in physical activities, 60 min, two times per week, eight weeks which totaled 18 classes. The physical activates for this intervention were used from a book Purposeful play of Renne M. McCall and Diane H. Craft, in which they are introducing Early Childhood Movement Activities on a Budget, adapted for Autistic children. Besides these games, we were using different physical fitness exercise that we could adapt for Autistic Preschool children.

Harrow and Dunlop (2001, p.763) note that students with autism who are fully included in PE class:

- display higher levels of engagement and social interaction,
- have larger friendship networks and
- Have developmentally more advanced individualized education plan goals than their counterparts in segregated placements.

According to Duronjić & Valkova (2010), autistic preschool children that are involved in physical activities have lower motor skills impairment comparing the same children before they were involved in any kind of physical activity.

3.5 Structure of intervention

The goal of intervention was enjoyment while improving movement proficiency.. Every class was planed in the way to follow Teaching Strategies:

- Capture attention
- Simple concise directions
- Specific instructions
- Demonstrations/Prompts with verbal instructions
- Provide variability in practice of skills
- Maintain appropriate class sizes
- Use a wide variety of equipment
- Keep lessons structured / consistent

- Provide success-oriented environment
- Repeat and review often
- Provide a lot of positive reinforcement
- Maximize active participation

3.6 Holiday for children

Holidays away from home for children and families has been recognized as a social policy concern across mainland Europe since the mid-20th century (Hazel, 2004). Parents feel that both they and their children were able to 'recharge their batteries' by getting a break from the everyday stressors of normal life in poverty. In addition, parents pointed to the family holiday as being a time that they could strengthen family relationships, spending 'quality time' together as a family away from the distractions of everyday problems. Summer camps without parents are not commonly organized for preschooler in general, less so for the children with disability.

The influence of holiday on motor skills can be positive or negative. Positive influence can be recognize if children participated in some special summer camps in which they were involved in physical activities. The most common are outdoor camps for autistic children were they usually spend a lot of time outside in the forest, sea, mountain etc. Summer camps can have a great positive influence on motor skills development. On the other side, if family couldn't afford summer camp for child, or any kind of outdoor activities like sea cost, mountains, or just spending time in the nature at the village with family, then that would have a negative influence on motor skills development. Children who spend most of holiday time at home, and didn't have any activates that could keep them physical active during the year, are likely to decrease the level of their motor skills performance.

3.7 Process of research

Research process started on February 2009 by visiting a kindergarten and selecting participant. The participants were selected according diagnoses and age. Director of kindergarten gave all information that are necessary for conducting this research: providing classroom for interventions, information about participants and their individual programs, approval from parents abut children's participation in research.

The first assessment was in spring 2009.

> Protocol from the MABC was followed, and standardized testing procedures were used. The test permits the administrator to give verbal directions, and a physical demonstration of the task. The instructions as well as the demonstration were given, acknowledged of the instrument. Author of this study measured and recorded with assistance of one faculty student. As examiner, the author was engaged in the observation of their motor performance with regards to qualitative patterns. The teacher of the students was also present, in order to make the students feel more comfortable and secure. The participants were randomly assigned to perform the 8 items of Movement ABC Test (a description of these items is presented in Appendix 1) and the time needed for each participant was approximately 40 min. After eight weeks of intervention the same testing procedure was repeated (Duronjić & Valkova, 2010).

Again after two months of summer holiday the same children were tested again on 1st of September ’09. The same protocol was followed as at the begging of research.

Parents of the children were informed about research and intervention procedure, and they gave their approval for children to participate in whole research procedure.

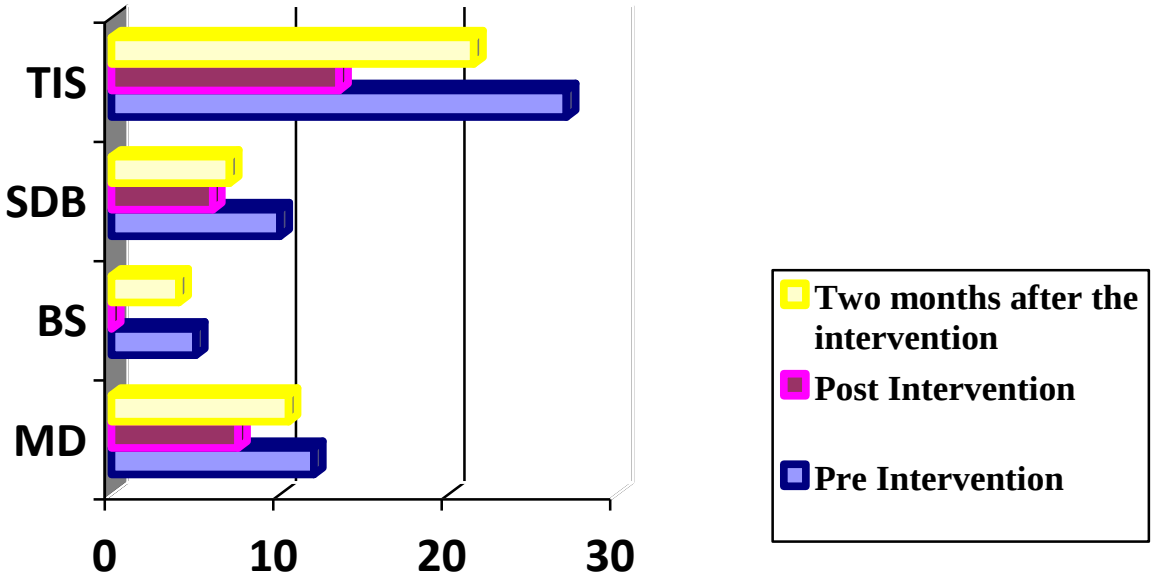
4 RESULTS

In this chapter quantitative and qualitative results are presented. We will focus manly on the quantitative results, pre and post intervention, that include the Total Impairment score (T.I.S), and the scores in the three Subtests of MABC, Manual Dexterity (M.D), Ball Skills (B.S) and Static & Dynamic Balance (S & D.B). T.I.S with the Subtest scores are presented in Table 13.5. The qualitative results include the personal observations during the intervention related to guideline in M-ABC test.

4.1 Participant One: P.S.

Male, 75 months old on the day of first assessment (77 months old after intervention and 79 months old on the day of third assessment). Diagnosed Asperger syndrome. He was enrolled in the kindergarten when he was 45 months old and accepted in a case study when he had already 30 months of involvement in the kindergarten. Predominant characteristics of this child are confusion, easily distracted and loss of concentration arising within activity. Another of his characteristics is day dreaming.

Graph 4.1.



	MD	BS	SDB	TIS
Two months after the intervention	10.5	4	7	21.5
Post Intervention	7.5	0	6	13.5
Pre Intervention	12	5	10	27

MD – Manual Dexterity

BS – Ball Skills

SDB – Static and Dynamic Balance

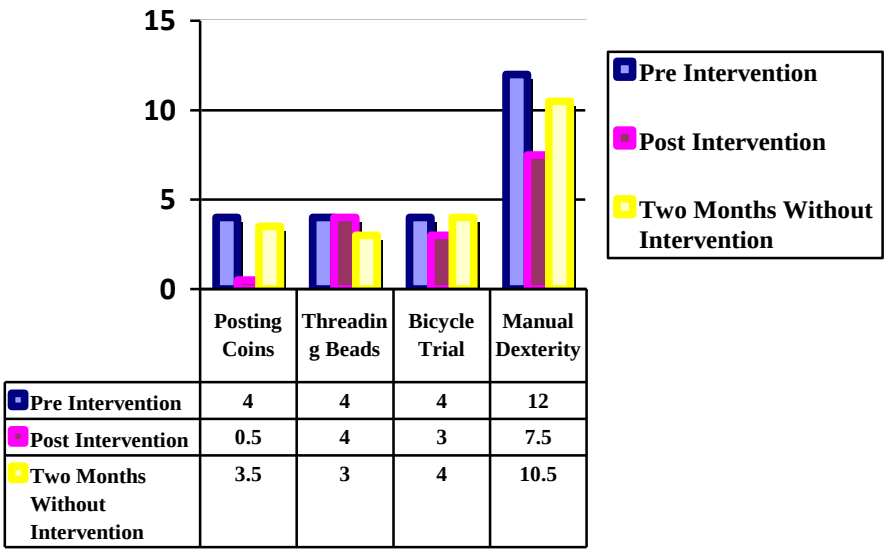
TIS – Total Impairment Score

In Graphe 4.1 we can see that P.S. obtained a total impairment score before intervention 27 which placed him below 1th percentile for his age, after the intervention 13.5 which placed him on the 5th percentile for his age and after two months without intervention 21.5 which placed him again below 1th.

In the subtest:

- Manual Dexterity scored 12 before intervention, 7.5 after intervention and after two months without intervention 10.5.

Graph 4.2

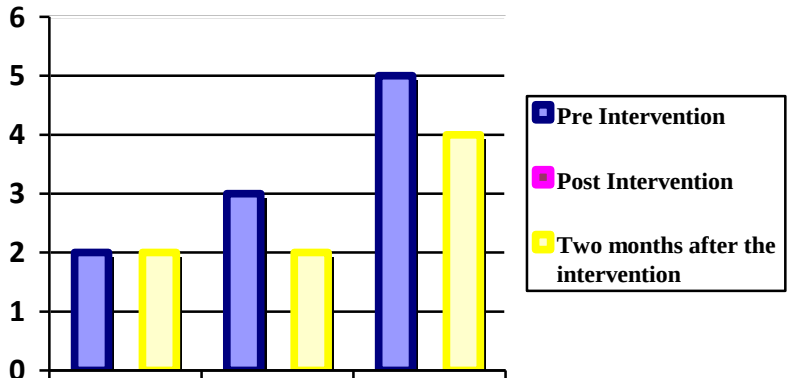


	Posting Coins	Threading Beads	Bicycle Trial	Manual Dexterity
Pre Intervention	4	4	4	12
Post Intervention	0.5	4	3	7.5
Two Months Without Intervention	3.5	3	4	10.5

In subtest of Manual dexterity a child scored better after intervention, worst after two months without intervention comparing post intervention results, but still better then pre intervention results. (Graph 4.1.1)

- Ball Skills scored 5 before intervention, 0 after intervention and after two months without intervention 4.

4.1.2

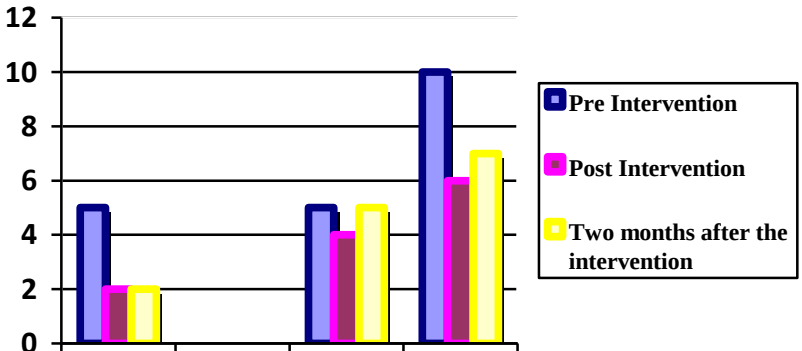


	Catching Bean Bag	Rolling Ball Into Goal	Ball Skills
Pre Intervention	2	3	5
Post Intervention	0	0	0
Two months after the intervention	2	2	4

Catching Bean Bag and Rolling Ball into the Goal scored better after intervention, i.e. without impairment in ball skills after intervention. Results from after two months without intervention of Ball skills are worst comparing post intervention results, but still better then pre intervention results.

- Static and Dynamic Balance scored 10 before intervention, 6 after intervention and after two months without intervention 7.

Graph 4.1.3



	One Leg Balance	Jumping Over Cord	Walking Heels Raised	Static and Dynamic Balance
Pre Intervention	5	0	5	10
Post Intervention	2	0	4	6
Two months after the intervention	2	0	5	7

One Leg Balance and Walking Heels Raised scored better after intervention worst after two months without intervention comparing post intervention results, but still better then pre intervention results, and in the test Jump Over Cord he was successful before and after intervention, and after two months without intervention as well. (Graph 4.1.3)

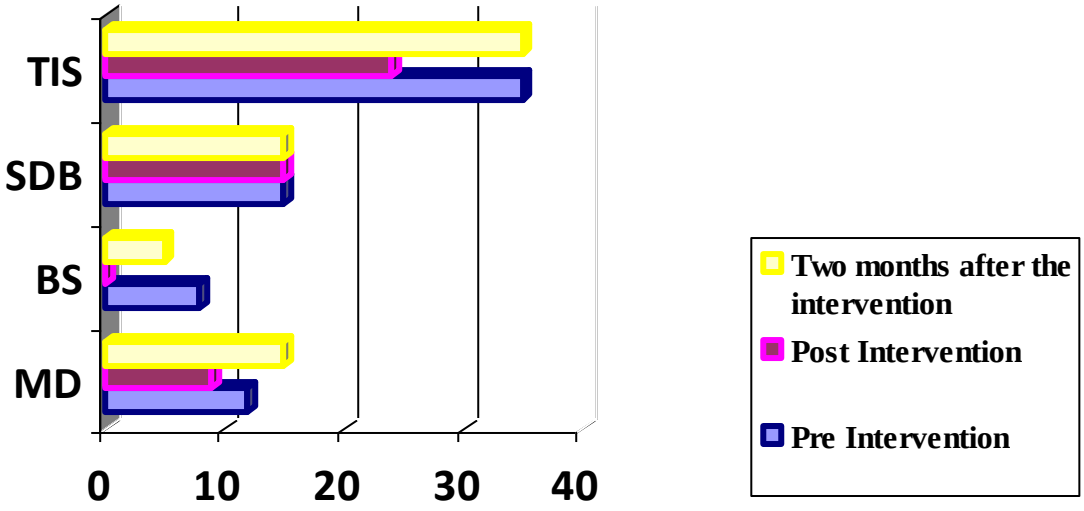
Qualitative results:

In general P.S. showed happiness and signs of joy during the whole time of the testing. All three tests he did well and he acted interested.

4.2 Participant Two: B.L.

Male, 68 months old on the day of first assessment (70 months old after intervention and 72 months old on the day of third assessment). Diagnosed with childhood autism and intellectual disability, behavior impairment and specific developmental delay of speech and language. He was enrolled in the kindergarten when he was 50 month old and accepted in a case study when he had already 18 months of involvement in the kindergarten. Predominant characteristics of this child are impulsivity, impatience, disorganization, easily distracted, confusion and los of concentration arising activity.

Graph 4.2.



	MD	BS	SDB	TIS
Two months after the intervention	15	5	15	35
Post Intervention	9	0	15	24
Pre Intervention	12	8	15	35

MD – Manual Dexterity

BS – Ball Skills

SDB – Static and Dynamic Balance

TIS – Total Impairment Score

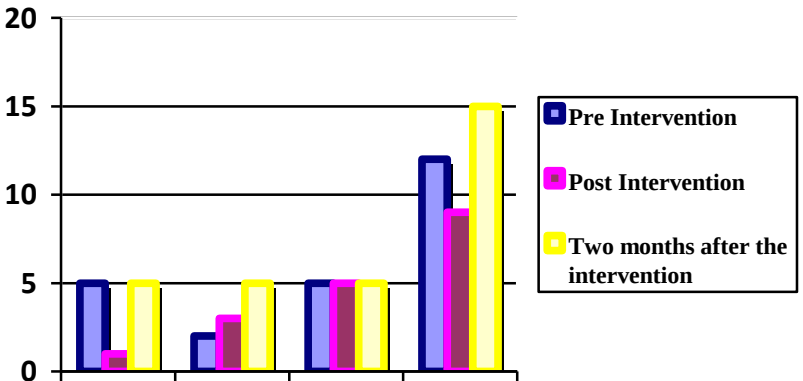
Quantitative results:

In Graph 4.2 we can see that B.L. obtained a total impairment score before intervention 35 after intervention 24 and after two months without intervention 35, again which placed him below 1th for his age.

In the subtest:

- Manual Dexterity scored 12 before intervention, 9 after intervention and 15 after two months without intervention.

Graph 4.2.2

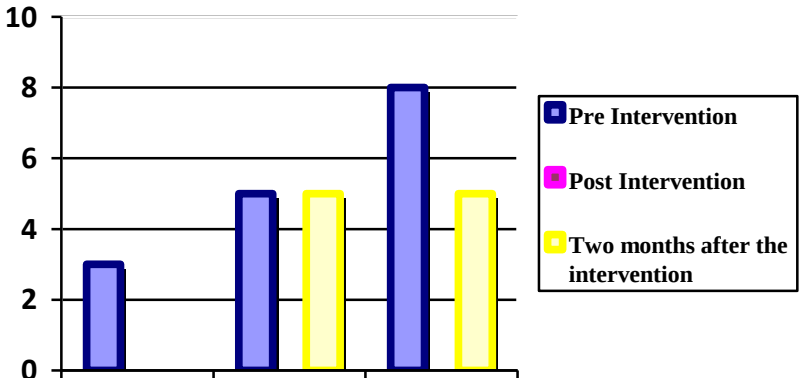


	Posting Coins	Threading Beads	Bicycle Trail	Manual Dexterity
Pre Intervention	5	2	5	12
Post Intervention	1	3	5	9
Two months after the intervention	5	5	5	15

Posting Coins scored better after intervention and after two months without intervention was the same as pre test. Threading Beds scored worst after intervention and after two months without intervention. Bicycle Trial no differences in results before, after intervention and after two months without intervention. (Graph 4.2.2)

- Ball Skills scored 8 before intervention, 0 after intervention and after two months without intervention 5.

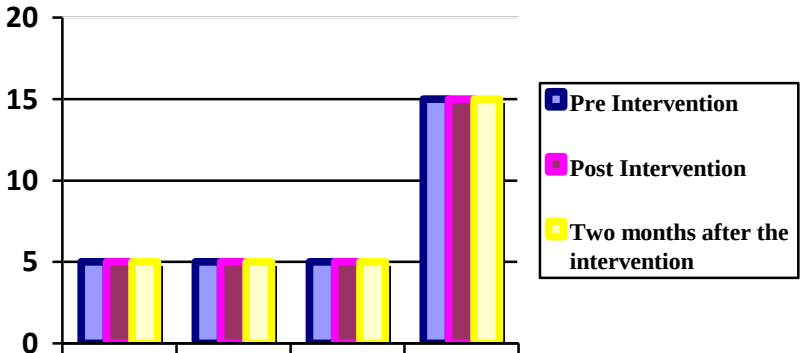
Graph 4.2.3



	Catching Bean Bag	Rolling Ball Into Goal	Ball Skills
Pre Intervention	3	5	8
Post Intervention	0	0	0
Two months after the intervention	0	5	5

Catching Bean Bag and Rolling Ball into the Goal scored better after intervention, i.e. without impairment in ball skills after intervention. After two months without intervention results of Ball skills are worst comparing post intervention results, but still better then pre intervention results.

- Static and Dynamic Balance scored 15 before intervention, 15 after intervention and 15 after two months without intervention.



	One Leg Balance	Jumping Over Cord	Walking Heels Raised	Static and Dynamic Balance
Pre Intervention	5	5	5	15
Post Intervention	5	5	5	15
Two months after the intervention	5	5	5	15

One Leg Balance, Walking Heels Raised and Jump Over Cord no differences in before and after intervention and after two months without intervention, i.e. maximum impairment score.

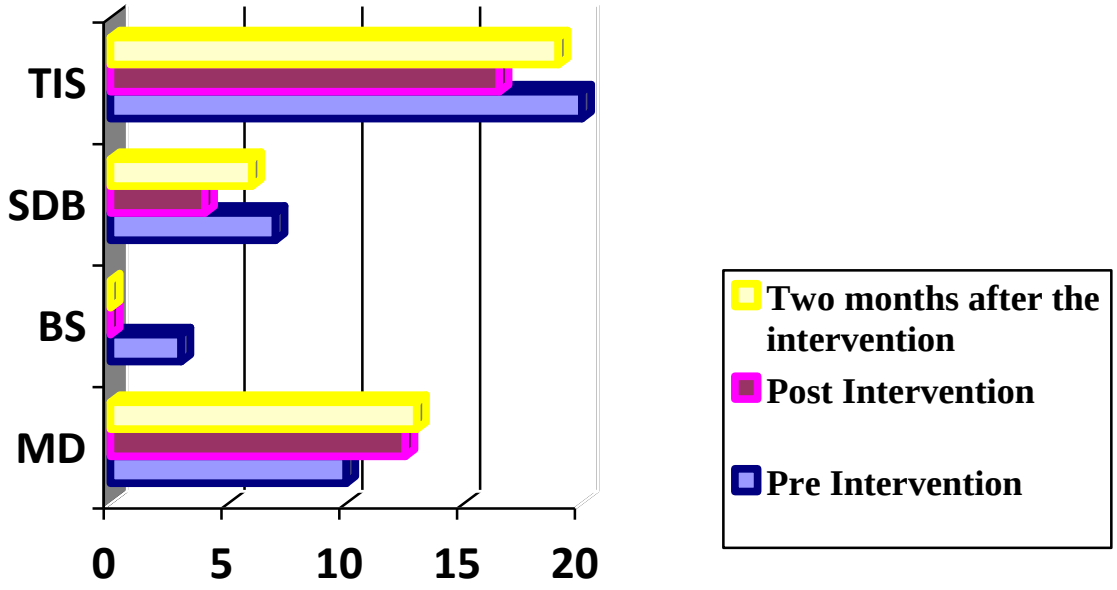
Qualitative results:

Although the assessment of B.L. showed improvements in his motor skills after intervention, he didn't seemed to be interested in assessment. During every assessment he needed assistance to perform any activity, mainly because he wasn't able to understand what he needed to do. He was not concentrated and many times during the assessment he was just looking around. He seemed hyperactive, was making unnecessary movements and was also speaking quietly without any specific meaning. During the testing procedure, he only showed interest in performing posting coins and threading beds, in which he was successful. In all other test though, he didn't show any interest.

*4.3 **Participant Three: M.A.***

Male, 69 months old on the day of first assessment (71 months old after intervention and 73 months old on the day of third assessment). Diagnosed with childhood autism. He was enrolled in the kindergarten when he was 63 month old and accepted in a case study when he had 6 months of involvement in the kindergarten. Predominant characteristics of this child are impulsivity, hyperactivity and easily distracted.

Graph 4.3



	MD	BS	SDB	TIS
Two months after the intervention	13	0	6	19
Post Intervention	12.5	0	4	16.5
Pre Intervention	10	3	7	20

MD – Manual Dexterity

BS – Ball Skills

SDB – Static and Dynamic Balance

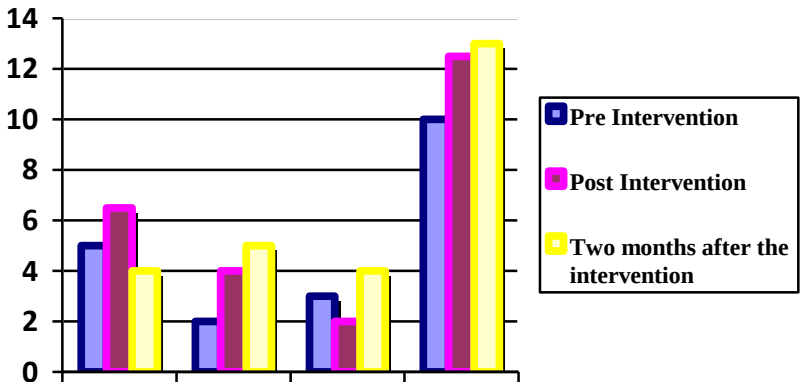
TIS – Total Impairment Score

Quantitative results:

In Table 5.3 we can see that M.A. obtained a total impairment score before intervention 20 which placed him on the 4th percentile for his age and after intervention 16.5 which placed him on the 6th percentile for his age and after two months without intervention 19 which placed him this time at 1th percentile for his age.

In the subtest:

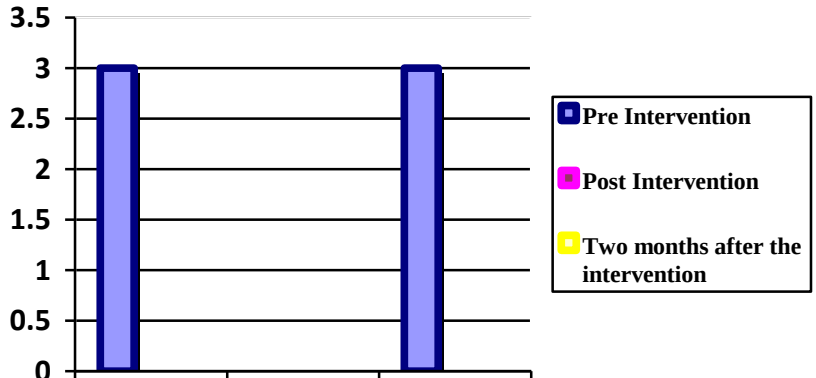
- Manual Dexterity scored 10 before intervention, 12.5 after intervention and after two months without intervention 13.



	Posting Coins	Threading Beads	Bicycle Trail	Manual Dexterity
Pre Intervention	5	2	3	10
Post Intervention	6.5	4	2	12.5
Two months after the intervention	4	5	4	13

Posting Coins and Threading Beds scored worst after intervention, but after two months without intervention Posting Coins scored better and Threading Beds worst comparing post intervention results. Bicycle Trial scored better after intervention and worst after two months without intervention.

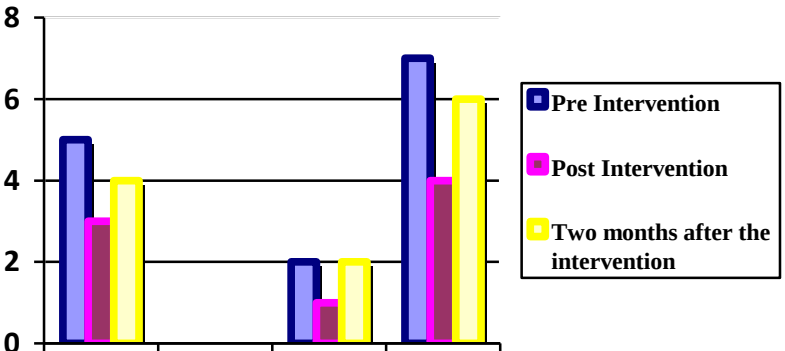
- Ball Skills scored 3 before intervention, 0 after intervention and 0 after two months without intervention.



	Catching Bean Bag	Rolling Ball Into Goal	Ball Skills
Pre Intervention	3	0	3
Post Intervention	0	0	0
Two months after the intervention	0	0	0

Catching Bean Bag scored better after intervention and Rolling Ball into the Goal was no impairments before and after intervention. Ball skills stayed without impairment after the two months without intervention..

- Static and Dynamic Balance scored 7 before intervention, 4 after intervention 6 after two months without intervention.



	One Leg Balance	Jumping Over Cord	Walking Heels Raised	Static and Dynamic Balance
Pre Intervention	5	0	2	7
Post Intervention	3	0	1	4
Two months after the intervention	4	0	2	6

One Leg Balance and Walking Heels Raised scored better after intervention and worst after two months without intervention comparing post intervention results, and in Jump Over Cord he was successful before and after intervention and after two months without intervention.

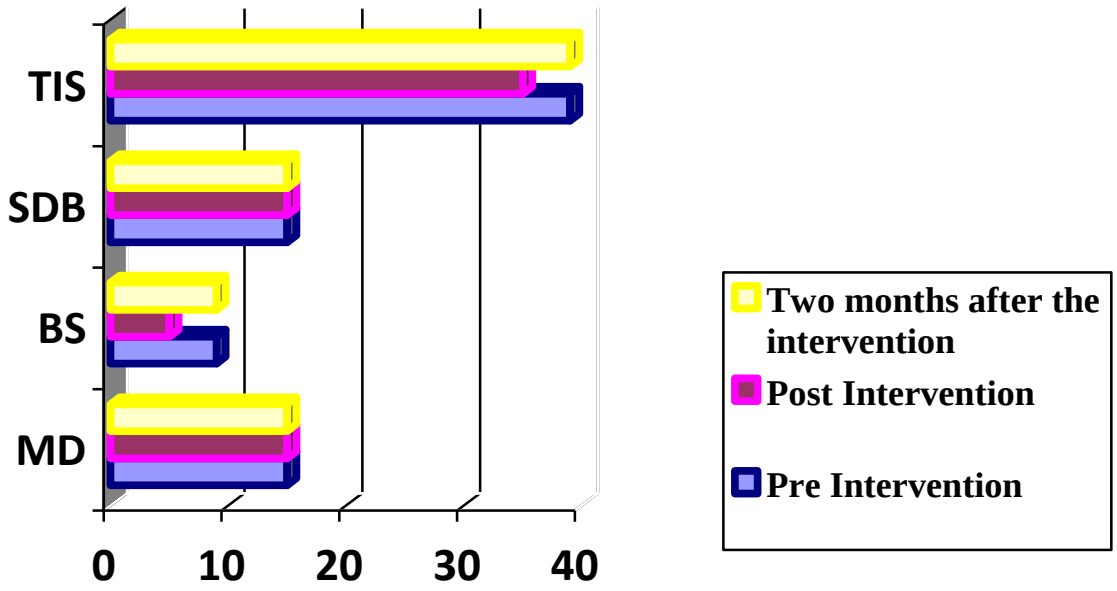
Qualitative results:

During the testing procedures he wasn't able to concentrate and exhibit eye contact. He didn't show any interest in testing procedure and we had to motivate him in different ways to finish testing.

4.4 Participant Four: O.K.

Male, 64 months old on the day of first assessment (64 months old after intervention and 66 months old on the day of third assessment). Diagnosed with childhood autism and intellectual disability. He was enrolled in the kindergarten when he was 58 months old and accepted in a case study when he had 6 months of involvement in the kindergarten. Predominant characteristics of this child are passive behavior, disorganization, confusion, and support and help essential in his education program.

Graph 4.4.



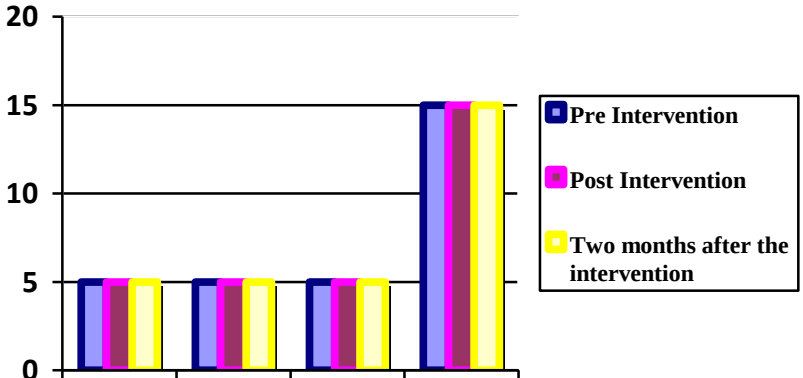
	MD	BS	SDB	TIS
Two months after the intervention	15	9	15	39
Post Intervention	15	5	15	35
Pre Intervention	15	9	15	39

Quantitative results:

In Table 5.4 we can see that O.K. obtained a total impairment score before intervention 39, after intervention 35 and after two months without intervention again 39 which placed him below 1th percentile for his age.

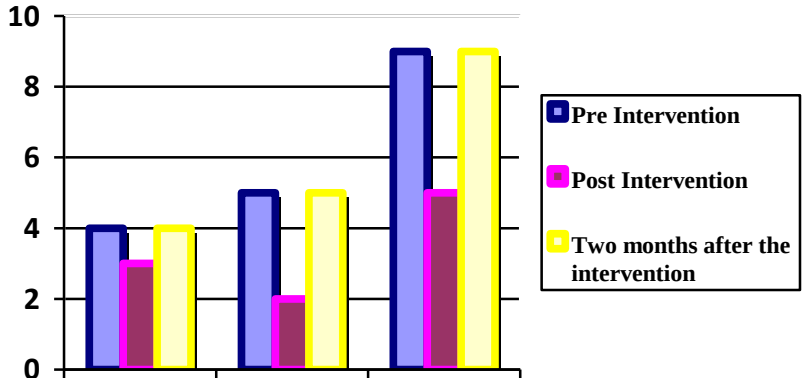
In the subtest:

- Manual Dexterity scored 15 before intervention, 15 after intervention and 15 after the holiday brake. No differences in before and after intervention and after two months without intervention.



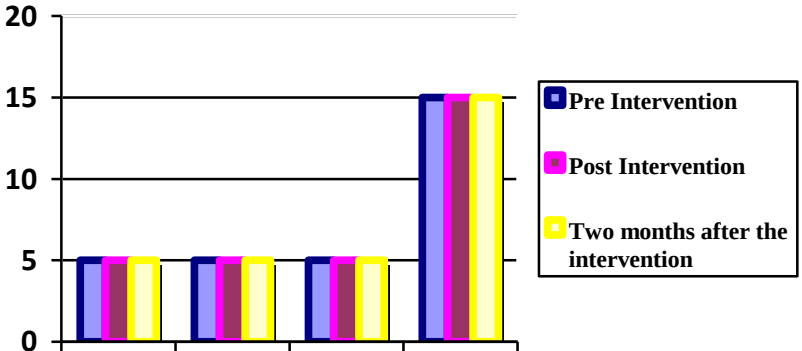
	Posting Coins	Threading Beads	Bicycle Trail	Manual Dexterity
Pre Intervention	5	5	5	15
Post Intervention	5	5	5	15
Two months after the intervention	5	5	5	15

- Ball Skills scored 9 before intervention, 5 after intervention and again 9 after two months without intervention. Catching Bean Bag and Rolling Ball into the Goal scored better after intervention but worst after two months without intervention comparing results of post intervention.



	Catching Bean Bag	Rolling Ball Into Goal	Ball Skills
Pre Intervention	4	5	9
Post Intervention	3	2	5
Two months after the intervention	4	5	9

- Static and Dynamic Balance scored 15 before intervention, 15 after intervention and 15 after two months without intervention. No differences in before and after intervention and after two months without intervention.



	One Leg Balance	Jumping Over Cord	Walking Heels Raised	Static and Dynamic Balance
Pre Intervention	5	5	5	15
Post Intervention	5	5	5	15
Two months after the intervention	5	5	5	15

Qualitative results:

He was motivated and concentrated for testing, but he has a high impairment of motor skills and moderate intellectual disability and he couldn't perform any test.

5 DISCUSSION

The main purpose of this research was to measure the extent of impairments in fine and gross motor skills concerning preschool children with autism spectrum disorder after the four months of which two were summer holiday. Before the holiday they were involved in physical activity intervention program which last eight weeks and they were tested before and after the intervention and after. All children with ASD had movement impairment according to the M-ABC. For the purpose of this study it is more meaningful to discuss each case separately.

Participant One: P.S. - had definite motor problem before intervention and after he had a degree of difficulty that is borderline. However, after the holiday his impairment score reached again a level of definite motor problem (Henderson & Sugden, 1992).

His total impairment score after intervention decreased for 50%, but after the two months of holiday total impairment score increased for 20%. This means that the influence of intervention was still visible, even after two months without intervention. His impairment score after holiday was lesser then before intervention in all subtests.

His test performance was the best among all the participants after the intervention and after the holiday. No resistance was noted during the testing. A possible explanation of this is that the presence of the children's teacher in every class made him feel comfortable.

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Participant Two: B.L. - had definite motor problem before and after intervention which is the same after two months of holiday. However, intervention decreased his impairment score for 27.5%, and the holiday brake increased again for 27.5%. This means that influence of intervention merge over the two months.

Generally, B.L. had a limited interaction with the environment and even more limited expressiveness during the whole intervention and testing procedure. In this perspective, the inquiry has demonstrated that social-skill deficits as well as different kinds of behavioral

problems seem to co-occur with attention, motor, and language problems (Szatmari, Offord, & Boyle, 1989; Moffitt, 1990; Frick, Kamphaus, Lahey, & Loeber, 1991; Kavale & Forness, 1996).

Participant Three: M.A. – had a serious developmental delay before intervention and intervention decreased his impairment score for 8.75%, and the holiday brake increased again for 6.25%. We can say now that the influence of intervention didn't completely merge over two months of holiday, and his impairment reached this time definite motor problem. A possible explanation might be the lack of concentration, motivation and eye contact during the testing procedure.

Regarding to the qualitative aspects of his performance, M.A. seemed to have a problem with the comprehension of the instructions. This problem, which is probably one of the main reasons that resulted to the child's low performance, could be due to an attention deficit, which is a common characteristic of autistic individuals (Frith & Hermelin, 1969; Fulkerson & Freeman, 1980; Varni, Loovas, Koegel & Everett 1979; Wing, 1976).

Participant Four: O.K. – had definite motor problem before and after intervention and without change after two months of holiday. After the intervention he improved only ball skill and this skill merge over the two months of holiday. Generally O.K. had limited interaction with the environment and even more limited expressiveness during the whole intervention procedure.

Since he is diagnosed with autism and mental retardation, and Auxter, Pyfer and Huettig (2005) stated that motor delays are very common among persons who are severely mentally retarded. Generally, the greater the intellectual disability is, the greater the lag in attaining major developmental milestones (Winnick, 2005). We think that improving motor skills for 10% was a great success for this child.

Despite the great impairment in motor development from autistic children tested in this study, they have the right to succeed and compete in motor programs, but they need the help, guidance and support from physical educators that are really willing to help these children improve their motor development. This is what I find of great importance.

In general, children with autism face difficulties in certain domains of motor development. Some of the observed characteristics that are common in children with autism are problems in gross and fine motor skills, repetitive and unusual movements of the body, perceptual deficits that affect psychomotor performance in specific fine manual motor skills. Some studies indicate that the reason for this impairment in their motor development is a biochemical error or a disturbance in the central nervous system but nothing is proved till now and new studies have to be made in order to distinguish what really affects and deteriorates this impairment.

There are also studies indicating that children with autism have problems with their motor imitation, so they cannot imitate a movement in order to learn it after a period of time, but there are studies as well that indicate improvements in motor imitation skills in children with autism.

Moreover, they have problems with social interaction, which means that they cannot learn some basic motor skills, as social interaction is required for this acquisition. For instance, for the acquisition of ball skills, children typically require partners to practice with, which automatically implies a social interaction.

Undoubtedly, we really have to distinguish them and plan individualized exercise motor programmes as they have different levels of impairments. They require special needs on a different manner, and they have specific motor delays that cannot be mixed together. So, motor programmes can only be successful if they are adapted to their own needs and contribute as a result to their mental, social, motor condition and healthy way of life.

Making exercise as a family activity is one way to increase physical activity among children. Parents should be encouraged to make healthy lifestyle as family commitment. Physical activities can be simple strolling in the park, bicycle riding or hiking every weekend. These activities, however, are not limited to outdoor activities or exercise. Doing household together

such as gardening or cleaning the house are also alternative ways. The key is to choose activities that all family members can participate. After all, the best place for developing a healthy lifestyle is in the home where the behavior and lifestyle to which children were exposed to while still young, will be good predictors of their behavior and lifestyle when they become adults. Children may never believe in everything parents say, but will follow everything parents do.

6 CONCLUSION

Children with autism possess communication and social skill abilities that may enable them to be included with their peers in educational and recreational settings. If children with autism have the ability to be a part of these educational and social groups, then it will be important to possess motor skills that will allow them to remain involved. Having these skills will increase possibility to be asked by peers to join the activity. This would be great opportunity for parents to watch theirs autistic children participating equally in physical activity that are typical for early childhood. It is important to understand the social and communication needs of preschool children with autism in order to support learning environment that give children the opportunity to master their motor skills.

The most important is that differences in motor skills levels occur over time in our sample of preschoolers with Autism Spectrum Disorder involved in the testing. The negative development of participants is presented related to the differences between pre and post, two months, of summer holiday. The decrease of their motor skill development was visible in quantities and qualitative way. All four children showed higher impairment in their motor skills after the two months of summer holiday. Three out of four children had lesser impairment score after the holiday then before the intervention. The intervention influence was merge over the time in our sample of autistic preschool children.

However, the main limitations associated with this study are:

- The participation of only four children,
- No control group,
- Lack of information about their activities during the holiday,
- Validity of ABC-M battery for preschool autistic children.

Regarding future research, the same testing procedures should be done in the bigger group of participants and with control group, so that generalization of the results would be acceptable and meaningful. Before holiday parents should be include in this research in the way to make diary of theirs children activities during the holiday.

For further research we would also recommend testing of validity and reliability of ABC-M battery for preschool children with autism.

Children need to be physical active during whole year, including the summer holiday. Organized outdoor activities and specialized camps for autistic children would keep them physical active. Those preschool children with autism need regular physical activity. This might help them to increase future participation in physical activity or sport.

We hope that this study will be a useful in the domain of adapted physical education for children with autism spectrum disorder and contribute in some way to the support and improvement of motor development in these populations.

7 SUMMARY

Although physical exercise is included in many regular education curricula, it is not systematically or consistently utilized with children with autism. Health benefits of various exercise programs have been touted, including changes in physical as well as mental wellbeing.

The aim was to show that physical inactivity during summer holiday lead to decreasing in motor skills development of our sample of autistic preschool children. Early physical activity intervention can help children with autism spectrum disorder to improve their motor skills in the level that will help them to be included in school and every day physical activity, but it is necessary to keep them active systematically during the whole year.

In the present study quantitative and qualitative aspects of motor skill performance of 4 preschoolers with autism spectrum disorders were examined before and after two months of summer holiday. The preschoolers were 4 males, from 66 to 79 months old and they were all recruited from the same special kindergarten.

Quantitative examination included the administration of MABC (Henderson & Sugden, 1992). Protocol from the MABC was followed (Appendix 2) and standardized testing procedures were used. Participants were measured on the following 8 items: posting coins, threading beads, bicycle trail, catching bean bag, rolling ball into goal, one-leg balance, jumping over cord, and walking heels raised. Qualitative results were based on personal observation, which was accomplished during the testing procedure. Meanwhile qualitative results were obtained through personal observation.

Summer holiday brake last two months, and children were tested pre and post. After the holiday brake, all four participants decreased their level of motor skills development. This study concluded that two months of physical inactivity during summer holiday leads to merging of influence of motor skills physical activity intervention and these autistic preschool children should follow systematic physical activities intervention during the whole year.

8 SOUHRN

Ačkoliv jsou tělesná cvičení zahrnuta ve většině klasických kurikul, není to nijak systematicky a důsledně sjednoceno pro děti trpící autismem. Sledovány byly jak zdravotní benefity různých cvičebních program, tak i duševní pohoda.

Cílem této práce bylo ukázat, že včasné intervence v oblasti pohybových aktivit mohou pomoci dětem s celou škálou autistických poruch při zlepšení jejich motorických dovedností až na úroveň, která jim umožní začlenění do školy a každodenní pohybové aktivity.

V předkládané studii byly na 5 předškolácích, kteří trpí autistickými poruchami, zkoumány kvantitativní i kvalitativní aspekty motorických dovedností a výkonu před I po vlastní pohybové intervenci. Soubor předškoláků byl tvořen 4 chlapci, ve věku od 66 měsíců do 79 měsíců a všichni tito probandi byli získání ze stejné speciální mateřské školy.

Kvantitativní testování zahrnovalo administraci MABC (Henderson & Sugden, 1992). Postupovali jsme podle protokolu MABC (příloha 2) a dále byly použity standardizované testovací procedury.

Participanti byli měřeni v následujících 8 položkách: přemístění mincí, navlékání korálků, bicyklová dráha, chytání váčku s fazolemi, rolování míče do branky, balance na jedné noze, skok přes lano a chůze na špičkách. Kvalitativní výsledky vycházely z individuálních pozorování, které byly realizovány v průběhu testovacích a intervenčních procedur.

Intervenční program zaměřený na motorické dovednosti trval osm týdnů a děti byly testovány před a po intervenčním programu. V průběhu intervenčního program čtyři participanti zlepšili své motorické dovednosti, zatímco jeden nikoliv. Závěrem této studie je, jestliže jsou děti předškolního věku, které trpí autismem, začleněni do nějaké formy pohybové aktivity alespoň dvakrát týdně, zlepší se tím jejich motorické a sociální dovednosti, které jim mohou napomoci v jejich dalším vývoji.

Rozdíly v úrovni motorických dovedností, u našeho výzkumného souboru předškoláků s autistickými poruchami, zahrnutými do našeho intervenčního programu, se vyskytly napříč

celým intervenčním programem. Při pre i post měření byly pozorovány pozitivní vývojové změny u participantů, kteří podstoupili tento intervenční program. Zlepšení bylo viditelné jak v kvantitativní oblasti, tak i v oblasti kvalitativní. Všech pět dětí projevilo radost a požitek s účasti na pohybových aktivitách a čtyři z pěti dětí zaznamenali výrazný progres v motorických dovednostech.

Školní letní prázdniny trvají dva měsíce a děti byly testovány před jejich zahájením a po skončení prázdnin. U všech čtyř účástníků byl zaznamenán pokles úrovně jejich motorických dovedností. Tato studie došla k závěru, že dva měsíce fyzické pasivity během letních prázdnin se nepříznivě podepisují na jejich fyzických výkonech a motorické obratnosti. Na základě těchto zjištění by měly být tyto autistické děti předškolního věku vystavovány systematické fyzické aktivitě během celého školního roku.

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10 APPENDIX 1

Description of age band one

Movement Assessment Battery for Children The M-ABC6 is a clinical assessment used to determine the extent of impairment in fine and gross motor skills. It includes eight items divided into three subtests; manual dexterity, ball skills, and static and dynamic balance; the tests are also divided into four age bands, with children undertaking different activities depending on their age. The battery has been purposely designed to identify deviant or impaired performance and will not provide information on the overall motor abilities of the child, if the skills are advanced for their age. Authors of this test have stated the purposes of its use as identification and screening, intervention planning, program evaluation and as a research tool (Wiart & Darrah, 2001). Although M-ABC was validated on children without disabilities, it can be used also with children with disabilities who have the ability to acquire normal motor patterns such as children with mental retardation, autism, visual impairments, and hearing impairments (Horvat, Block, & Kelly, in press). The performance test can be administered to children from the age of four up to the age of 12. In all, there are 32 items in the battery – subdivided into the four age categories. These age categories are called "age bands" and are distributed as follows. Age band one (4–6 years), age band two (7–8 years), age band three (9–10 years) and age band four (11+ years). For the purpose of this study, age band one is used. With 8 tasks in each age band, these are again divided into three areas, each associated with a different area of motor development. All three areas are identical throughout the battery in order to allow for continuation from one age band to the next and to allow for the monitoring of progression as the child grows older. The three areas are manual dexterity (MD), ball skills (BS) and static and dynamic balance (SDB) and the 8 tasks within the first two age bands are highlighted below.

PC – posting coins (MD)
TB – threading beads (MD)
BT – bicycle trail (MD)
CBB – catching bean bag (BS)
RBG – rolling ball into goal (BS)
OLB – one leg balance (SDB)
JOC – jumping over cord (SDB)
WHR – walking heels raised (SDB)

Age band one

1.) Manual dexterity (M. D.)

Posting coins (P. C.)

The purpose of this task is to drop 12 coins in a bank box (through a slot on the surface of the box) as quickly as possible. The participant has 1 practice attempt and 2 formal trials for each hand. The score corresponds to the number of seconds taken to complete each correct trial.

Threading beads (T. B.)

In this task participants who are 5 and 6 years old are asked to place 12 cube shaped beads on a lace as quickly as possible, while for participants who are 4 years old the task consists of 6 cube shaped beads. The child has 1 practice attempt and 2 formal

trials, after choosing the hand which he/she will use. The score corresponds to the number of seconds taken to complete each correct trial.

Bicycle trail (B. T.)

The purpose of this task is to draw a single continuous line, following the trail without crossing its boundaries. The child has 1 practice attempt and 2 formal trials. The score corresponds to the number of errors that is the number of times the drawn line crosses the boundaries.

2.) Ball skills (B. S.)

Catching bean bag (C. B. B.)

In this task the examiner tosses a bean bag from a distance of 2 m and the participant is asked to catch it. The participant is given 5 practice attempts and 10 formal trials. The score corresponds to the number of correctly executed catches out of 10 trials.

Rolling ball into goal (R. B.)

The purpose of this task is to roll a tennis ball into a goal which is placed in a 2 m distance from the starting line. The participant must stay behind the starting line and he/she is given 5 practice attempts and 10 formal trials. The score corresponds to the number of correctly executed goals out of 10 trials.

3.) Static & dynamic balance (S. & D. B.)

One leg balance (O. L. B.)

The purpose of this task is to stand on one leg for up to 20 s. Both legs are tested and the child is given 1 practice attempt (10 s) and 2 formal trials for each leg. The score corresponds to the number of seconds (up to 20) that the child maintains balance.

Jumping over a cord (J. O. C.)

In this task the child is asked to jump with feet together over a cord which is placed on the level of the lower border of his/her knee cap. The participant is given 1 practice attempt and 3 formal trials. The score can be either P for a successful jump, or F for a failed jump.

Walking with heels raised (W. H. R.)

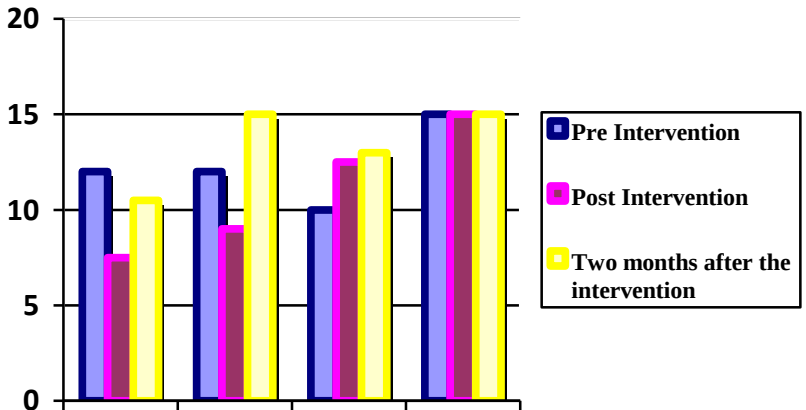
The purpose of this task is to walk along a straight line with heels raised without stepping off the line. Fifteen steps are required. The participant is given 1 practice attempt, which consists of 5 steps, and 3 formal trials. The score corresponds to
the number of correct consecutive steps that the child accomplished

11 APPENDIX 2

Manual Dexterity

Manual dexterity: speed and accuracy of movement for each hand, eye-hand coordination for the dominant or preferred hand, coordination of both hands for a single task.

Table 11.1



	P.S	B.L.	M.A.	O.K.
Pre Intervention	12	12	10	15
Post Intervention	7.5	9	12.5	15
Two months after the intervention	10.5	15	13	15

Table 11.1 show's that two children improved their Manual Dexterity skills after the intervention, one had worst score and one child the same (maximum impairment score in Manual Dexterity before and after intervention).

After holiday results comparing after intervention results: shows that all children had worst score.

After holiday results comparing before intervention results: shows that one child has improved Manual Dexterity and the rest had worst or same score.

- P.S.
  - pre test and post test: decreased for 30%
  - post test and after holiday test: increased for 20%

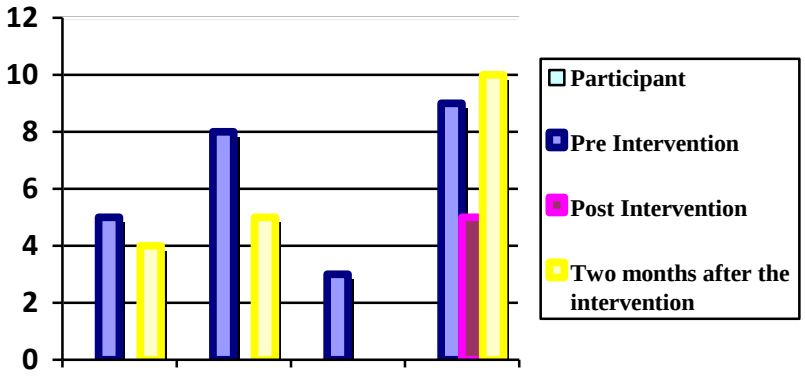
- B.L.
  - pre test and post test: decreased for 20%
  - post test and after holiday test: increased for 40%
- M.A.
  - pre test and post test: decreased for 16.67%
  - after holiday and post test: increased for 3.33%

- O.K. no difference before and after intervention and after holiday

Ball Skills

Ball skills test the abilities to aim and catch a ball using both hands.

Table 11.2



Participant	P.S	B.L.	M.A.	O.K.
Pre Intervention	5	8	3	9
Post Intervention	0	0	0	5
Two months after the intervention	4	5	0	10

A table 11.2 show's that all children improved their Ball Skills after the intervention. After holiday results show that three out or four had worst score comparing post intervention results; one child had same result which is no impairment in ball skills.

But if we compare pre intervention and after holiday results we will see that three out of four had better score and one worst.

- P.S.
  - pre test and post test: decreased for 50%
  - post test and after holiday test: increased for 40%
- B.L.
  - pre test and post test: decreased for 80%
  - post test and after holiday test: increased for 50%

- M.A.
  - pre test and post test: decreased for 30%
  - post test and after holiday test: same result

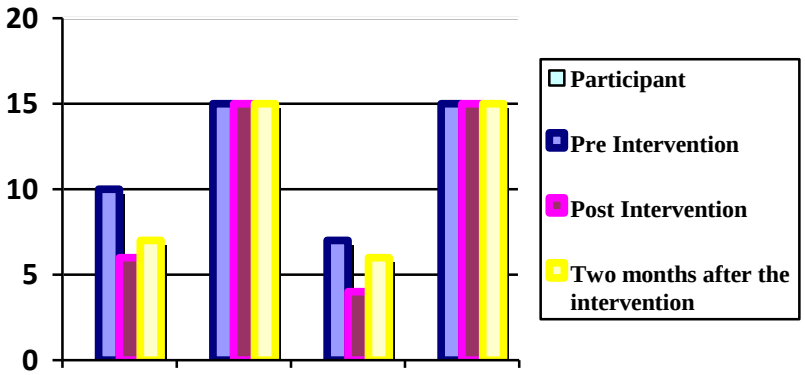
- O.K.

  - pre test and post test: decreased for 40%
  - post test and after holiday test: increased for 50%

Static and Dynamic Balance

Balance tasks include static ability to hold a position and dynamic ability that involves being able to make spatially precise movements slowly, and with control of momentum.

Table 11.3



Participant	P.S	B.L.	M.A.	O.K.
Pre Intervention	10	15	7	15
Post Intervention	6	15	4	15
Two months after the intervention	7	15	6	15

Table 11.3 shows' that two children improved their Static and Dynamic Balance and two children have the same (maximum impairment score in Static and Dynamic Balance before and after intervention). After holiday results shows worst or the same score comparing post intervention results. But in comparing results from pre intervention two had better score and two same.

- P.S.
  - pre test and post test: decreased for 26%
  - post test and after holiday test: increased for 6.66%

- B.L.
  - pre test and post test: same result
  - post test and after holiday test: same result

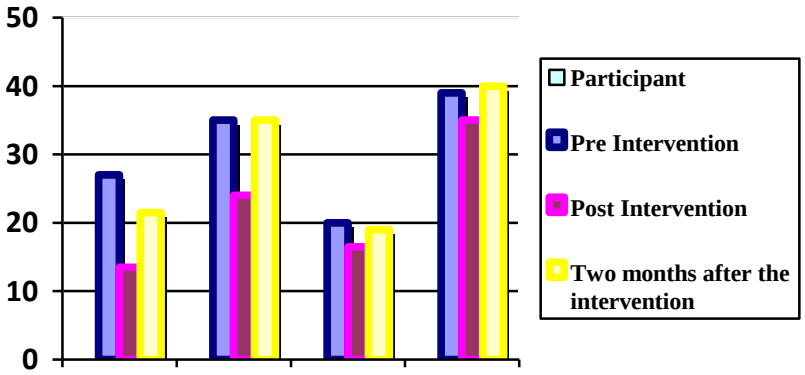
- M.A.
  - pre test and post test: decreased for 20%
  - post test and after holiday test: increased for 13.34%

- O.K.
  - pre test and post test: same result
  - post test and after holiday test: same result

Total impairment score

A total impairment score is obtained from the sum of subsections and may then be converted to a percentile rank. A raw score of 0 to 9.5 is considered to be within the average range, a score of 10 to 13.5 (5th–15th percentile) is considered borderline, and scores of more than 13.5 (<5th percentile) are indicative of definite motor difficulties.

Table 13.4



Participant	P.S	B.L.	M.A.	O.K.
Pre Intervention	27	35	20	39
Post Intervention	13.5	24	16.5	35
Two months after the intervention	21.5	35	19	40

A table 11.4 show's that all children improved their motor skills after the intervention. After holiday they all have worst score comparing post intervention results. But after holiday results are better then pre intervention for three children and one has a worst score.

- P.S.
  - pre test and post test: decreased for 50%
  - post test and after holiday test: increased for 20%
- B.L.
  - pre test and post test: decreased for 27.5%
  - post test and after holiday test: increased for 27.5%

- M.A.
  - pre test and post test: decreased for 8.75%
  - post test and after holiday test: increased for 6.25%

- O.K.
  - pre test and post test: decreased for 10%
  - post test and after holiday test: increased for 12.5%

Total impairment scores and subtests

Raw scores are converted to scaled scores, which range from 0 to 5, with higher scores representing greater impairment.

Table 11.5

		Before Intervention				**After Intervention**				**After Holiday**			
Number	Participant	MD	BS	SDB	TIS	MD	BS	SDB	TIS	MD	BS	SDB	TIS
1	P.S.	12	5	10	27	7,5	0	6	13,5	10.5	4	7	21.5
2	B.L.	12	8	15	35	9	0	15	24	15	5	15	35
3	M.A.	10	3	7	20	12,5	0	4	16,5	13	0	6	19
4	O.K.	15	9	15	39	15	5	15	35	15	10	15	40

In table 11.5 are summarized all results of test with subtests.