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Review Article

Using Special Physical Education Curriculum-Based Measurement to Improve Student Motor Development in Both General and Special Needs Population: Review of Early Research Lasting More than Five Decades

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Abstract

The main goal of this study is to acquaint experts in the field of education with the results of early research, which are related to the problems they face even now when it comes to sensitive groups with special needs. Previous experiences can be a good indicator of different models of action for pedagogues and managers within the modern education system. Inclusive education has become a reality faced by all participants in the process. Effective action models have been adopted in developed countries, primarily Western countries. However, in less developed countries, it is evident that the problem of inclusion is faced later, primarily due to legal regulations and the need for more funds for specific training of all participants. This issue is especially neglected when it comes to inclusion in the physical education of children with various disorders in motor development. Examples from practice in earlier research can be a good guide for overcoming various obstacles that all participants face today, both in special and inclusive physical education. Controversies are still occurring between supporters of the traditional particular education approach versus the modern, inclusive education model. A better familiarity with the issue can contribute to overcoming prejudices, which this overview study of earlier research can contribute.

Keywords: previous studies, special physical education, measuring tools, motor development, children with special needs

Introduction

Teaching Physical Education, as an organized and systematically planned activity, among other things, is directed to the harmonic development of pupils by applying positive influences of physical exercises and effects of environmental factors. Motor functions are directly related to cognitive and affective functions of a personality, particularly at early school age, so with the significant impulse of motor development, it is possible to realize the necessity of the integral development of pupils. The results of the research on the influence of physical exercising point that changes in the development of certain body functions are possible, especially in the periods of natural increase of their tasks, and that, according to the majority of authors who treated this issue, is the period of early school age (Kukolj, 1999).

Numerous studies revealed that during childhood, the child's motor abilities improve (Bénéfice et al., 1999; Davies & Lose, 2000). Recently, a certain number of researches appeared dealing with the influence of gender on the structure of motor abilities. Based on such studies and research, the structure of motor abilities does not change throughout life, i.e., it is common for males and females (Fratrić & Rubin, 2007; Marsh, 1993). However, in particular, in studies that attempted to establish differences in motor abilities between boys and girls in early childhood, boys achieved better scores in the majority of motor tests, particularly in the tests of strength (Backman, 1988; Bénéfice et al., 1999; Zurc et al., 2005). Two major groups of factors that influence the child's development and account for gender differences in the results of motor tasks are hereditary (biological) factors and social factors (Haywood & Getchell, 2005; Hottinger, 1983). Research on preschool children (Pišot, 2000) showed that boys scored higher than girls in jumping tests (e.g., high jump, standing broad jump). Also, a few studies showed significant differences in motor tests between boys and girls in early elementary school (Pejčić & Malacko, 2005; Rodić, 1999). The boys achieved better in the following variables: speed of movement, explosive strength, body coordination, dynamic muscular endurance, static muscular endurance, and aerobic endurance, whereas the girls scored better only in the flexibility variable (Pejičić & Malacko, 2005). On the other hand, other authors have found no significant gender differences in motor abilities between the ages of seven and twelve (Deoreo & Keogh, 1983; Kukolj, 1999).

Since one of the principal tasks of physical education is the development and reaching of the optimal level of motor abilities of the pupils, and taking into consideration the results of the research so far, it is evident that planning PE teaching is a complex procedure that attempts to objectify the regularities of entire children development. The results of the research on preschool children show that the structure of the motor area is almost identical for both genders, so it is possible to make one program of physical exercises that will be applied to both boys and girls regardless of the quantitative differences that exist

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between them (Fratrić & Rubin, 2006). Is it enough to have one physical exercise program for both genders and is it necessary to plan separate programs to develop boys' and girls' motor abilities in the early school-age period?

As the contribution to the hypothesis that the efficacy in tests for the estimation of motor abilities is possible to explain with the integral function of CNS, which represents as well the basis of intellectual functioning, speak the result of Reitana (1971), which points out that group of children with cerebral damage has as well weaker results in both cognitive and motor function, on the which base author made conclude that the cognitive and motor abilities are in relation (Gredelj et al. 1975, pp. 18-19).

Therefore, this review aims to understand the developmental status of physical fitness in children and adolescents with unique needs (intellectually and physically disabled) aged 11-19.

Problem and Definition

Physical activity is any bodily movement produced by skeletal muscle resulting in a substantial increase in resting energy expenditure Bouchard et al. (as cited in Winnick, 2005, p. 402). They cite seven categories of physical activity (exercise, sport, training, play, dance, work, and domestic chores) and suggest that patterns of physical activity which are manipulating the variables of frequency (how often), intensity (how hard), and duration (how long).

It is a common concern that today's children and adolescents participate in an insufficient amount of physical activity (Andersen et al., 2006; Ekelund et al., 2004). A growing body of evidence shows that such inactivity threatens health and well-being in adults and children (Andersen et al., 2006; Boreham & Riddoch, 2001). Lack of physical activity has been identified as a probable mediator of obesity (Ekelund et al., 2004; Gutin et al., 2005) and cardiovascular risk factors in children and adolescents (Andersen et al., 2006; Boreham & Riddoch, 2001).

More active children may also develop higher peak bone mass compared with less active children (Hallal et al. 2004). The individual's physical activity pattern over recent weeks and months is a primary determinant of physical fitness (Blair et al., 2001), defined as a set of inherent or achieved personal attributes that relate to the ability to perform physical activity (Caspersen et al., 1985). Casperson et al. (1985, p. 129) defined Physical fitness as a "set of attributes that people have or achieve that relates to the ability to perform physical activity." The components of physical fitness are of two groups: health-related fitness and skill/performance-related fitness.

Health-related physical fitness "refers to those components of fitness that are affected by habitual physical activity and relate to health status, characterized by (a) an ability to perform and sustain daily activities and (b) demonstration of traits or capacities that are associated with a low risk of premature development of diseases and conditions related to movement" Pate (as cited in Winnick, 2005).

Most experts agree that health-related fitness components include aerobic or cardio-respiratory endurance, body composition, muscular strength, muscular endurance, and flexibility (the latter three are often referred to as musculoskeletal functioning or health-related fitness (Howley, 2001). They are usually associated with disease prevention and health promotion (Powell et al., 1998). Skill-related physical fitness (also known as performance-related fitness) generally includes balance, coordination, speed, agility, power, and reaction time, reflecting the performance aspect of physical fitness (Howley, 2001).

As these definitions suggest, relations exist among health-related physical fitness, physical activity, and health. In essence, each of these areas can influence and be influenced by the others. Increases in physical activity and physical fitness can contribute to positive health.

Daily activities require children to master different motor skills (Henderson & Sugden, 1992). Among these are the skills essential to biological functioning, like crawling, walking, and running, as well as those required for adequate social functioning, like dressing and playing.

Motor competence can be considered as a person's ability to execute different motor acts, including coordination of both fine (e.g., manual dexterity) and gross motor skills (e.g., static and dynamic balance) (Henderson & Sugden, 1992). Motor competence has essential implications for different aspects of development in children and adolescents (Piek et al., 2006).

Some of the existing tests for motor competence [the movement assessment battery for children (MABC)] typically focus on balance, speed, and accuracy of movement coordination with little concern for the health-related components included in the term physical fitness. Generally, test items on motor competence demand little muscular strength, endurance, flexibility, and aerobic performance. The interaction between health-related fitness, performance-related fitness, and motor abilities is evident. Whenever performing movement activities, varying degrees of these components are required (Gallahue & Ozmun, 2006). It is difficult, if not impossible, to obtain a pure measure of essential components in physical fitness. Even in test and laboratory settings, only an indirect indication of the essential components is possible (Gallahue & Ozmun, 2006). However, it can be argued that physical fitness differs from motor competence because it includes health-related components such as endurance, strength, flexibility, and body composition (Fjørtoft et al., 2003; Haga, 2008). These four are essential systems; a systematic program of exercise aimed at these components can improve physical fitness (Haywood & Getchell, 2005).

It is intuitively evident that physically skillful children are more physically active (Reed et al., 2004) and that there is a close relationship between habitual physical activity and motor competence (Okely et al., 2001; Thompson et al., 1994; Wrotniak et al., 2006). However, the results from studies that explored the relationship between physical activity and motor competence are consonant in that these variables are not strongly related (Fisher et al., 2005; Okely et al., 2001; Reed et al., 2004). To date, there have been few empirical studies of the relationship between measured physical fitness and motor competence in children. A better understanding of the nature of this relationship helps maintain and develop sufficient physical fitness and motor competence in children, as they are potentially significant contributors to their health and well-being. Over the years, several studies have compared the physical fitness performance of youth with disabilities to those without disabilities.

With few exceptions, research using subjects with intellectual disabilities, cerebral palsy, spinal cord injuries, and visual impairments has found that the fitness performance of youngsters with disabilities is below that of their peers without disabilities.

To the extent that the fitness of youngsters with disabilities falls below acceptable levels, students with disabilities are probably at greater risk for the health concerns mentioned previously than students without disabilities (Winnick, 2005, p. 404).

Individuals with intellectual disabilities present a diversity of abilities and potential, and educators must be prepared to accept this diversity. Intellectual disabilities substantially disadvantage individuals attempting to function in society. Cognitive and functional limitations in areas such as daily living skills, social skills, and communication have some limitations.

Physical and Motor Characteristics of Children with Intellectual Disabilities[1]

Children with intellectual disabilities differ least from children without intellectual disabilities in their motor characteristics. Although most children with intellectual disabilities display developmental motor delays, they are often related more to limited attention and comprehension than to physiological or

[1] This chapter was presented, with minor corrections, after Popović, M. (2011). *The evaluation of motor development in elementary and secondary school children with intellectual disabilities* (pp. 3-7) [Unpublished master's thesis]. Department in Adapted Physical Activities, Faculty of Physical Culture, Palacky University in Olomouc, Olomouc, Czech Republic.

motor control deficits. As a group, children with intellectual disabilities walk and talk later, are slightly shorter, and usually are more susceptible to physical problems and illnesses than other children. In comparative studies, children with intellectual disabilities consistently score lower than children without intellectual disabilities on measures of strength, endurance, agility, balance, running speed, flexibility, and reaction time. Although many students with intellectual disabilities can successfully compete with their peers without intellectual disabilities, those students needing extensive support have a discrepancy equivalent to four or more years behind their peers without intellectual disabilities on tests of physical fitness and motor performance (Winnick, 2005, p. 141).

The results of research that examined the relationship between cognitive and personality characteristics and motor abilities can significantly contribute to the explanation of the structure of motor abilities. One of the very first studies to investigate the relationship between motor abilities and intellectual abilities was that of Kulcinskia (as cited in Ismail & Gruber 1977), which established that the relation between intelligence and learning of basic motor tasks is higher when the intellectual level of examinees is higher.

For establishing the functioning of motor abilities, research conducted on the samples of the general population of different intellectual development is more important. As mentioned, Leithwood (as cited in Ismail, 1976a) has established the existence of a relation between motor abilities and intelligence in a sample of preschool children of over-average intelligence, while Brace (as cited in Ismail, 1976b) noted that the relation is better in retarded than in standard samples of the population. Dingman and Silverstein (as cited in Dobbins et al., 1991) established in the group of retarded significant relation (.21) between tapping and intelligence, while Sengstock, 1966 (as cited in Dobbins et al., 1991) analyzed the differences in motor abilities (speed, power, endurance, and coordination) between a group of ordinary (1) and two groups of retarded of which the one was of the same chronological age (2) and the other was the same of mental age (3) as the group of ordinary. He established that group (1) was the best, and group (3) the weakest considered the investigated abilities. However, it is problematic to question to which extent it is possible to compare the group results of (2) and (3), considering that different anthropometrical status which is a consequence of unequal/different chronological ages. The study of Liemohna and Knapczyka (as cited in Kukolj et al., 2002) noted the indices that the structure of motor abilities in retarded is not significantly different from those of normal. For the battery of 32 tests of motor and motor-perceptive abilities, they have established six interpretable factors (coordination of upper extremities, the ability to reproduce rhythm tasks, general-muscles coordination, control of significant body motion, the ability to plan motor acts and dynamic balance) on the sample of retarded subjects.

A significant contribution to examining the relation between motor and intellectual functions is the work of Ismail and Gruber (1965), in which the factor structure of the tests of intellectual and motor abilities was estimated. Except for physical growth and development, general balance, coordination of lower extremities, dynamic balance on the objects, coordination of eye-hand-leg, kinesthetic memory, and "motor result performed with lower extremities" was isolated, as well as the dimension, interpreted as academic development.

Only the tests of coordination and measures of intellectual abilities have a high projection on this factor. Similar results were established by Ismail & Gruber (as cited in Ismail, 1976c). Kirkendall and Ismail (1976), by whom the significant prediction of intelligence is possible based on the results in motor tasks, only with the tests of coordination and partial balance have had a significant partial predictive validity. Analyzing the same problem, Kirkendall and Gruber, 1968 (as cited in Ismail, 1976c) have established that the tests of cognitive abilities have a positive canonical correlation of (.44) with tests of coordination, as well as (.42) with the test of strength and the canonical correlation of the whole battery of tests of motor abilities and the tests for the estimation of intellectual abilities as (.55).

Review of the Related Literature

Short Review of Studies in Special Education[2]

Humphrey (1973) provided an analysis of using motor activity learning in developing science concepts with slow learning in fifth-grade children. This study compared the motor activity technique of learning using physical education activities with traditional ways of developing science concepts with fifth-grade slow-learning children. Two groups of ten children each were equated based on pretest scores. The same classroom teacher taught both groups. One group was involved in motor activity learning, and the other was involved in traditional procedures. Both groups are re-tested after a two-week teaching period and again after a three-month extended interval. The difference in the posttest scores favored the motor activity learning group, $p = .01$ ($t = 4.33$, $df = 9$). The difference in the extended interval test also favored the same group, $p = .001$ ($t = 6.37$, $df = 9$). Using the differences in test scores as criteria for learning, the children in the motor activity learning group learned and retained significantly more than those in the traditional group.

Forness (1979) analyzed the Clinical criteria for mainstreaming mildly handicapped children. Although integrating disabled children into regular classrooms has become a well-established educational practice, the clinical decision to mainstream a given child can systematically consider several factors. Among these are age, pervasiveness and degree of handicap, curriculum, social skills, class size, teacher competency, and family resources. These criteria are discussed, along with various approaches and pertinent evidence for and against mainstreaming.

Hessler and Sosnowsky (1979) provided an analysis on A review of aptitude-treatment interaction studies with people with disabilities. Twenty aptitude-treatment interaction (ATI) studies that used disabled students as subjects are reviewed to determine the validity of the ATI concept with disabled students. Since only four studies resulted in significant dis-ordinal aptitude-treatment interactions, the ATI concept, based on present information, needs to be validated.

Horne (1979) provided an analysis on Attitudes and mainstreaming: A literature review for school psychologists: Mainstreaming legislation requires that special needs students participate in regular classroom activities to the extent possible. Studies indicate that neither parents, peers, nor professionals may have expectations to hold positive attitudes toward these students or be competent providers of positive growth experiences. Existing evidence supports the need for comprehensive training programs for these groups, which provide an interface between their experiences with special needs students and an introduction to new knowledge. School psychologists should assume a leadership role in development and implementation.

Bracken and Fagan (1988) provided an analysis of the Abilities assessed by the K-ABC mental processing subtests: The perceptions of practitioners with varying degrees of experience. Eighty practitioners with varying levels of experience in administering the Kaufman Assessment Battery for Children (K-ABC) must complete a K-ABC abilities matrix to indicate their perceptions of the specific abilities assessed by each of the ten K-ABC Mental Processing subtests. The practitioners' responses were compared to the perceptions of the K-ABC authors, and in roughly half of the judgments, a majority of the practitioners agreed with the test authors. In contrast, the remaining judgments constituted majority disagreements. The practitioners associated additional psycho-educational abilities or skills not identified previously by the K-ABC authors with several of the K-

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ABC subtests. Rethazi and Keeton Wilson (1988) analyzed the K-ABC in assessing learning-disabled children. The authors of the K-ABC assert that, in addition to a discrepancy between learning potential and academic achievement, a learning disability is characterized by poor sequential relative to simultaneous processing skills. Based on these characteristics, The present study design must determine whether the K-ABC could discriminate between learning-disabled and normal children. Forty-three LD pupils aged 7 to 12 years and 20, typically achieving children of similar age, were administered the K-ABC. Results indicated that scores on the Sequential Processing Scale were significantly lower for the LD and the normal children than on the Simultaneous Processing Scale. In addition, the discrepancy between Simultaneous and Sequential scale scores has a similar distribution in both groups. The LD group scored low, and the average group scored higher on the Achievement Scale than the Mental Processing Composite. The results indicated that the K-ABC differentiated LD from normal children in terms of achievement relative to MPC scores; however, it failed to reveal a unique profile pattern related to simultaneous vs. sequential processing skills for the LD group. Further analysis of the relationship between K-ABC processing scale scores and WISC-R scores, as re-categorized by Bannatyne, revealed significant correlations between measures, indicating similar underlying theoretical constructs.

Barona and Faykus (1992) analyzed the Differential effects of sociocultural variables on special education eligibility categories. The influence of sociocultural factors (ethnicity, socioeconomic status, father absence, and family size) on special education eligibility evaluation for three ethnic groups. A multiple regression procedure was used to analyze the data on 300 students referred for evaluation and found to be either not eligible for services or eligible for services as mentally retarded or learning disabled. Results indicated that only socioeconomic status and ethnicity significantly contributed to the prediction of all three groups. Individually, the father's absence and family size did not contribute to the prediction of special education eligibility. Results of this study suggest that legislative mandates to control sociocultural factors in determining special education eligibility have been only partially successful.

Rog (1992) analyzed Child and adolescent mental health services: Evaluation challenges. Recent developments in the field of children's mental health, particularly the development of community-based systems of care, are being used to improve the availability and effectiveness of services for children. This chapter highlights unique problems and challenges to evaluators studying these systems of care.

Mehrens and Clarizio (1993) analyzed the Curriculum-based measurement: Conceptual and psychometric considerations. This review of published literature and research critically examines the conceptual and psychometric problems associated with curriculum-based measurement (CBM) related to eligibility decision-making and programming for special education. Even though the CBM can provide a helpful supplement in assessing and remedying academic difficulties, it suffers from many criticisms leveled at traditional assessments and some unique limitations. It is concluded that CBM, to be of most value, needs to be part of a more extensive systematic psycho-educational assessment program rather than a replacement for it.

Scruggs and Mastropieri (1995) provided an analysis of the Science and students with mental retardation: An analysis of curriculum features and learner characteristics. Although much research has been conducted on the learning characteristics of individuals with mental retardation, science learning of such individuals has received far less attention. In this investigation, students with mental retardation were observed over two years in order to determine how the characteristics of mental retardation manifested themselves in the context of an inquiry-oriented, hands-on science curriculum. Analysis of all relevant data sources, including observations and field notes, videotape and audiotape recordings, student products, and interviews, suggested that several characteristics commonly attributed to students with mild mental retardation were observed to interact with the science curriculum. These characteristics included attention, semantic memory, logical reasoning, and outer directedness. However, teachers were skilled at adapting instruction to meet the unique needs of these learners. Implications for teaching science to students with mental retardation are provided.

Havey (1999) analyzed the School psychologists' involvement in special education due process hearings. A sample of practicing school psychologists was surveyed regarding their experiences with and views of the due process hearing system. Thirty-eight percent of those surveyed reported that they had been called upon to testify at one or more due process hearings. Those who had testified reported that they were on the stand for an average of approximately 1 hour and spent an average of 7.5 hours in preparation. The most common issues on which school psychologists testified were assessment and appropriateness of placement. Attorney attorneys represented schools and parents in 70% of the hearings. Parents requested the hearing 72% of the time but prevailed in only 32% of the hearings. Respondents indicated that they agreed that their hearings had been conducted primarily professionally and fairly.

Southam-Gerow and Kendall (2000) provided an analysis of cognitive-behavior therapy (CBT) with youth: advances, challenges, and future directions. CBT is one of the most widely researched therapies for children and adolescents. This paper describes the general tenets of CBT, followed by a review of the treatment outcome literature. Overall, there is strong empirical support for CBT with internalizing disorders such as anxiety and depressive disorders. In contrast, more moderate empirical support exists for CBT with externalizing disorders such as attention-deficit hyperactivity disorder and conduct disorder. The relative efficacy of individual, family, and group forms of CBT is also examined. Finally, future directions for research on CBT are discussed, including (a) determining the focal person(s) of treatment, (b) the importance of field effectiveness trials, and (c) the integration of CBT with other approaches (e.g., function analytic techniques, acceptance-based approaches).

Lightfoot (2001) provided an analysis of Supporting pupils with special health needs in mainstream schools: Policy and Practice. Education policy favoring inclusion, together with medical advances, means that a growing number of pupils in mainstream schools may have health-related support needs in respect of a chronic illness or physical disability. Data from an empirical research study investigating these needs carried out between 1996 and 1998 are used to reflect on the position of this group of pupils within policy guidance on special educational needs (SEN) and medical needs. Evidence of confusion and ambiguity, both in the guidance and its interpretation, suggests that the needs of this group remain somewhat hidden. More recent developments in special needs policy guidance are discussed regarding the prospect of strengthening support for this group of pupils.

Morris et al. (2002) provided an analysis of The inclusion of children: Authors explored the policy and practice in the placement of disabled children within the residential schools. Despite increasing policy commitment by the government to the inclusion of children with special educational needs in mainstream services, significant numbers of disabled children continue to be placed away from their family homes and communities in residential schools. Reliable statistical information on them is elusive, and there has been a dearth of research on how placement decisions are made and the experience of such placements for disabled children and their families. This article reports on the policies and practices of 21 education and social service authorities in England in this area, the patterns of residential placements, and the apparent reasons for them. It also highlights the points of concern about the protection and promotion of the welfare of disabled children in residential schools and the apparent lack of clarity on the part of local authorities concerning their duties in this area.

Copley and Ziviani (2004) analyzed the Barriers to using assistive technology for children with multiple disabilities. Assistive technology has aided children with multiple disabilities to improve access and participation in school and home environments. Effective educational outcomes from assistive

technology use depend on a coordinated assessment and implementation process. The literature on assistive technology with children was reviewed to identify barriers to effective school integration. These barriers included inadequate staff training and support, negative staff attitudes, inadequate assessment and planning processes, insufficient funding, difficulties procuring and managing equipment, and time constraints. A team model for assistive technology assessment and planning is proposed to optimize the educational goal achievement of children with multiple disabilities. Such a model can target allocating occupational therapy resources in schools to promote the best educational and broader functional outcomes from assistive technology use.

Hyde and Power (2004) provided an analysis of Inclusion of deaf students: An examination of definitions of inclusion about findings of a recent Australian study of deaf students in regular classes. This paper considers the definitions of inclusion for deaf students, particularly those relating to the general education class model. Some of the findings of a recent study by the authors of deaf students in regular schools are used to reflect on current policies and practices and how these relate to the implementation of inclusion in Australia.

Sari (2005) provided An analysis of the relationship between the identity patterns of Turkish deaf adolescents and the communication modes used in special residential schools for the hard of hearing and deaf. This study examined the relationship between identity patterns and the communication modes of deaf adolescents aged between 14 and 18 in Turkey. They were currently educated in the state residential secondary schools for deaf students. Deaf adolescents were administered the Deaf Identity "Scalersquo" presented in Turkish using total communication modes. The instrument measuring identity choice was administered to 90 students at three residential state schools for deaf students. Based on the questionnaire responses, students were classified into three groups: those with a predominantly culturally Hearing Identity, those with a primary Culturally Deaf Identity, and those who identified with both groups—a Bicultural (Dual) Identity. Analyses focused on the relationship between the students' identities and the communication methods they reported using. The data indicated that dual identity was consistently associated with better communication and combined modes.

Stecker et al. (2005) analyzed Using curriculum-based measurement (CBM) to improve student achievement: Review of Research. This review examines the efficacy of CBM as an assessment methodology for enhancing student achievement. They describe experimental-contrast studies in reading and mathematics in which teachers used CBM to monitor student progress and to make instructional decisions. Overall, teachers' use of CBM produced significant gains in student achievement; however, several critical variables appeared to be associated with enhanced achievement for students with disabilities: teachers' use of systematic data-based decision rules, skills analysis feedback, and instructional recommendations for making program modifications. In general education, the positive effects of CBM were associated with using class profiles and implementing peer-assisted learning strategies. Implications for instructional Practice and future applications of CBM are described.

Zentall (2005) analyzed the Theory- and evidence-based strategies for children with attention problems. This article reviews factors that contribute to and improve selective and sustained attention in children with attention deficit hyperactivity disorder (ADHD - the inattentive and combined subtypes). A brief review of interventions for inattention included psycho-stimulant medication, behavioral consequences, active learning, Practice, and cognitive behavioral (self-monitoring) techniques. Some of these traditional methods must be applied differently to children with ADHD, and some methods were found to be without empirical support. In contrast, educational interventions that involve increasing antecedent (task and setting) stimulus conditions have been demonstrated to normalize attention, and some improved the attention performance of children with ADHD beyond that of their peers.

Hung and Paul (2006) provided an analysis of the Inclusion of students who are deaf or hard of hearing: secondary school hearing students' perspectives. This paper focuses on secondary school hearing students' perspectives on including peers who are deaf or hard of hearing (D/HH) in their general education classrooms. Adopting insights from contact theory and ecological theory of human development, the researchers examined the effects of contact-related factors (contact experience, closeness, and class norms) and demographical variables (class setting, grade level, and gender) on hearing students' attitudes toward inclusion of peers who are D/HH through the use of self-reported survey data. The findings and their implications for educational Practice are also discussed.

Dlouhy (2008) has performed a study on The Influence of the special intervention program on the development of the attention and achievement motivation of young people with hearing handicaps. This article deals with the problems of the development of attention and the achievement motivation of young adolescent people with hearing disability via special intervention motion programs. The basic empiric procedure was chosen via simple experiment or, more precisely, quasi-experiment in the frame of the methodology of the work. The motion program is the primary experimental factor, consisting of the self-defense and the psychomotor activity. The primary research method is The standardized test of attention and aspiration level (Bakalaf, 1987), as mentioned by Dlouhy (2008) and the standardized test of aspiration level (Bakalaf, 1987). The determined hypothesis that the attention level end the achievement motivation of the experimental group of young people with hearing disability will increase due to the interventional program was confirmed. The research validated the assumption that self-defense, or more precisely its foundations together with psychomotor activity, explicitly influences the development of attention and achievement motivation of the selected group of young people with hearing disability.

Review of Studies Concerned with the Situation Measurement of Motor Development (*Physical Fitness*) *in Children with Intellectual Disabilities*[3]

Greyerova and Blahutkova (2008) have performed a study related to The Influence of motor activities and changes in the educational process of pupils with minor mental retardation. This work introduces the ongoing research to the public. The objective of our research is to prove the improvement of the motor skills, cognitive, emotional, and social skills of children or pupils with minor mental retardation with the help of regular sessions of non-traditional motor activities. The research is taking place at the elementary and practical school "Svitani" in Pardubice. The chosen pupils are the ones with a minor mental retardation. The authors used structured questionnaires, guided interviews, systematic, intentional observations, and chosen psycho-diagnostic tests to discover their skills and prove the hypotheses. The defects in motor activities are connected to work habits; getting these under control improves social integration.

Ozer et al. (2008) have performed the study of The importance of sport in improving the quality of life of intellectually disabled children, "Akdeniz University" sample. Sport is a needed occupation for a healthy and happy life. Moving, exercising, and participating in sports activities make people happy, and this happiness increases people's life motivation. Children with special needs have "physical education and sports justice" like the other children. A sports program For children with special needs was introduced at Akdeniz University in 2001 for the first time to meet the sports needs of children with special needs in Turkey. In the university's sports area, 50 student volunteers administer this program, in which 90 athletes train on the weekends.

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Regarding volunteers, the goal is to provide physical education teacher candidates with working experience with intellectually disabled children and opportunities to practice civic involvement. Children with intellectual disabilities need to develop their fundamental movement skills and physical fitness, gain sports skills, promote lifelong exercise habits, and participate in and adapt to social life. Parents: To understand the positive effects of Sports education on their children and to develop cooperation and mutual support between families.

In terms of society: To demonstrate that children with intellectual disabilities can be successful in different fields if convenient educational opportunities are given, To increase awareness of society's responsibility to provide better educational opportunities for children with intellectual disabilities.

Ješina (2009) has performed a study on centres of inclusion support adapted physical activity through adapted physical activity. The contribution describes the content of the project Centres of Inclusion Support. The project is focused on improving the rights and possibilities of children, pupils, and students, including those with special education needs. The author will create and improve the system of support services for all students with special education needs and their parents. The author prepares to improve the competencies of pedagogical workers. The aim was to socialize people with special needs and prevent social exclusion.

Čepička et al. (2009) performed a study related to the evaluation of gross motor skills in children with handicaps. Gross motor skills are essential for social interaction on the playground and performance in physical education. The measurement of gross motor skills is widely used to identify children with developmental delays—the present study aimed to assess the reliability of the gross motor development-2 (TGMD-2) test. Fifteen children with a mean age of 5.88 years (*sd* = .72) participated; nine were boys, and six were girls. The results confirm the assumption that the testing of gross motor skills in children with psychic handicaps is disputable. However, additional study is needed on a larger sample of children.

Valkova (2009) presented the Adapted physical activities – the challenge for research study. Research in anthropology includes a wide range of populations examined in terms of age, environment, and contents of activity or assessment (physiology, psychology). Their schemes, approaches, and established traditions are used richly and considered "habitual" research. Research in adapted physical activity (APA) is limited to specific features of minority groups, individual diagnoses, the phenomenon of "the different," and the absence of adequate techniques. Papers focus on conformity and differences in habitual research and APA. The general principles of quality research apply to both habitual and APA research. APA research must be designed with some specifics and modifications.

Alibegović and Tulumović (2010) point out that the primary purpose of this study was to determine differences in psychomotor skills of low-vision children about visual acuity. Twenty-nine (29) low-vision children between 6 and 15 years of age were tested. Psychomotor skills were evaluated using the Ozeretsky test. After using single-factor variance analysis (ANOVA), the results showed significant differences in motor skills of low-vision children depending on their visual acuity. Using correlation analysis, authors have determined the connection between motor quotient and visual acuity.

Brojčin et al. (2010), authors looked at the Behavioral and emotional problems of persons with intellectual disability. Behavioral problems are pretty common among persons with intellectual disability (ID). However, these problems are not easily defined because they depend on the perception of the surroundings. Persons with ID who manifest behavioral problems are more likely to be institutionalized in psychiatric institutions. It is estimated that persons with ID are three to four times more likely than the typical population to have psychopathological disorders. In addition, it is believed that 30% to 60% of children and adolescents with ID also have behavioral disorders. This article deals with the relationship between behavioral-emotional problems and the level of intellectual functioning, age, educational setting, and epilepsy of persons with ID. The specific manifestations of these problems, such as aggression, self-mutilation, stereotyped behavior, mood disorders, and thinking disorders, are also discussed.

Buha-Đurović (2010) examines the relationship between Executive functions and social behavior in children with mild intellectual disability. Executive functions refer to a cluster of interrelated skills necessary for purposeful, goal-directed activity. These functions are necessary for adaptive behavior, and they have a vital role in non-routine, novel, or complex situations, as well as in situations that require the integration of experiences and knowledge. Previous research suggests that executive functions are vital in cognitive development and academic functioning. However, less attention has been paid to the concept of executive functions concerning social behavior, especially in persons with intellectual disability. This paper reports findings about the relationship between executive functions and social skills in children with mild intellectual disability. The sample consisted of 100 children, both sexes, aged from 10 to 13 years. Analysis revealed that social skills significantly correlate to planning ability (strategy employment) and inhibitory control.

Đurić-Zdravković and Japundža-Milisavljević (2010) Geometric pseudo terms and visual construction in children with intellectual disabilities. This work aims to assess the visual-constructive abilities in children with mild ID and older school age as one of the conditions for the high-quality adoption of geometric terms and the establishment of correlativity with mastering geometric program content. The objectives are also planned to establish improperly accepted geometric terms content. The sample of this research contains 90 students. Criteria for choosing interviewees were IQ (between 50 and 65), calendar age (between 5th and 8th grade), and absence of neurological, psychiatric, sensor, expressed emotional, and combined disorders. The visual-constructive organization is examined with Test-matching complex figures, whereas the criterion knowledge test was used to estimate mastering geometrical contents. Bots of instruments are specifically designed for this research. The paper indicated the difficulties of visual-constructive figure analysis, identification of correlates with mastering geometric content, and improperly adopted terms of this program. Implications of the paper refer to suggestions of repetition and exercise by games through definite contents, demonstrations, experiments, and teaching means appropriate for geometry teaching, whose application will ensure and solidify a proper form of the geometry concept.

Gligorović (2010), the paper reports on Simultaneous cognitive processing in children with mild intellectual disability. The sample contains 40 children with mild intellectual disability, 12-16 years of age. For the assessment of simultaneous processing, we used the Simultaneous Processing Scale, part of the K-ABC, assigned to assess children and adolescents 3-18 years of age. The study's results highlight the difficulties in all assessed domains of simultaneous processing, especially in the tasks that contain coordination between simultaneous processing and planning.

Ilić and Nikolić (2010) examined Motor ability as a basis of psychomotor development of preschool children with disabilities. In this work, some analysis was done to emphasize motor activities as the basis of harmonic development of preschool children and gave some project proposals for implementing these activities in preschool programs. According to results from the screening of the motor ability of 25 children in developmental groups by the Dial 3 test, the motor ability of those children is at a deficient level. In fact, "Potential delay" is a characteristic of 24 children, and just one is in the category "OK" with a standard deviation of 16%. When addressing the motor ability needs of these children and analyzing preschool programs, a conclusion can be drawn that there are not enough motor activities for children with this kind of disability, especially in the preschool period. In preschool programs, there are more activities for fine motor ability than for developing gross motor ability. The activities and the number of children involved will depend on the special educator. Their motivation, knowledge, tools, and equipment are crucial for children when choosing a suitable activity. We need to involve all kinds of special educators in preschool institutions and do more intensive motor activities in these programs.

Japundža-Milisavljevi and Maćešić-Petrović (2010) have examined the Productivity of verbal learning in children with mild intellectual disability. The study aims to define and identify factors that significantly correlate to the learning curve of children with mild intellectual disabilities. One hundred twenty-four participants with intellectual disabilities, aged 8-16, were assessed using the Ray Verbal Learning Test. The study identifies a very high percentage of unsuccessful participants. On the one hand, the correlation analysis of the learning curve and chronological and school age, gender distribution, IQ, and socioeconomic status of their families; on the other, it shows statistical correlations with the chronological age of the children only. No significant differences are identified concerning their school age, gender distribution, and socioeconomic status, suggesting the possibility that learning curves are independent of these variables and are only statistically related to chronological age.

Maćešić-Petrović and Đurić-Zdravković (2010) provide a paper that Discusses areas of cognitive and intellectual functioning in correlation with behavioral functioning of children with mild intellectual disability, such as behavior difficulties with or without hyperactivity and attention disorders. The study covered 124 children with mild intellectual disability attending elementary schools in Belgrade. The WISC scale of intellectual functioning was used to assess their cognitive functioning. The Connors Rating Scale for Children was also used in educational settings, and different classroom behavior areas, such as participation in the group with peers and attitude towards authority, were covered. The study's results suggest the presence of disorders in behavior and attention functioning ranging from 11.2% to 40.4%. It also highlights differences between the different degrees of complexity of cognitive functioning in tested developmental areas discussed in the paper. The paper emphasizes the importance of the use of multimodal approaches to developmental disabilities of the tested sample, such as Behavioral interventions, Pharmacotherapy approaches, Teamwork (professionals and non-professionals), Multimodal treatment (combination of the therapeutic approach), Complementary treatment (education and psychosocial interventions); and individually based treatment such as IEP and ITP (Individual et al. Plains).

Maksimović and Golubović (2010). This paper deals with problems and possibilities of developing the physical abilities of pupils with visual impairment by a program with an individual educational plan as the integral element of pupils' inclusive education. Respecting the position and the role of the individual educational plan and corrective education, along with other non-educational activities dedicated to pupils with visual impairment, conditions are provided that prompt development and contribute to the maximization of possible effects upon the comprehensive development of the pupil. The research sample included 12 pupils with visual impairment aged 6.5 to 11.5 who, in a three-month, underwent the activities envisaged by IEP aiming at the development of different physical abilities in three months. The research on physical abilities was carried out according to EUROFIT (European Test of Physical Fitness), which is comprised of 9 tests of motor skills that mark levels of the following physical abilities: speed, strength, endurance, flexibility, and balance. In marking the dimensions of coordination and precision, we used tests of physical abilities published by the Institute of Physical Education and Sports Medicine of Yugoslavia (1988). Differences between initial and final measurements were statistically significant. Therefore, IEP activities highly stimulate the improvement of the physical abilities of pupils with visual impairment.

***Examination of Children's Movement Difficulties*[4]**

The TOMI/Movement ABC has been used in many studies examining children's motor performance.

These can be divided into two types: those that describe the nature and extent of any movement difficulties and those that take an experimental approach, examining factors considered to underlie the difficulties.

The majority of these studies focus on children who might in the past have been called 'clumsy' but who may now be formally classified as suffering from 'developmental coordination disorder' (DCD: American Psychiatric Association, 1994) or 'specific developmental disorder of motor function' (SDDMF: World Health Organization, 1992). These are children who have considerable difficulties in the performance of everyday movement tasks in the absence of any apparent sensory, physical, or neurological disorder. Very occasionally, the children of interest suffer from specific and isolated difficulties, such as handwriting problems. The test has also been used with two other groups of children: those who suffer from an identified medical condition affecting motor performance and those whose primary difficulty lies in some other realm, such as language or attention, but whose concomitant motor difficulties are of general concern.

Most of the studies in this section compare a "target" group of impaired children with a control group. When the target group of children suffers from an identifiable medical condition such as muscular dystrophy, then the selection and classification of subjects do not present a problem. In contrast, the absence of clearly specified criteria for DCD/SDDMF has led to various classification criteria being used. Where the TOMI/Movement ABC has been employed as the motor measure, there is variation between studies regarding the cut-off point used. Some included children only if they scored below the 5th percentile; some used the 10th percentile, and some used the 15th. Others use terms such as 'mild,' 'mode,' te,' and 'de, finite' motor problems but do not relate these to test scores.

Many, but not all, of the studies on DCD include some measure of intelligence in the selection procedure (usually a version of the Wechsler scales). IQ scores are then used to exclude any child whose motor impairment may be attributable to a more pervasive delay. However, the exact cut-off point for exclusion varies between studies, with some using full-scale IQ scores and others only the verbal component. For those studies in which both verbal and performance IQ are measured, some report that performance IQ is significantly lower than verbal IQ, although this finding is inconsistent. In the best studies, IQ is also used as a variable to select matched control children.

The number of boys and girls in the studies focusing on children with DCD is not always specified, but when it is, there are always more boys than girls. Due to the nature of the selection procedures, it is not always clear whether this accurately represents the population from which these children are drawn. However, this pattern does seem to reflect the general finding that more boys suffer from developmental disorders than girls.

Among the studies we have labeled descriptive, some use the TOMI/Movement ABC to describe subjects' movement difficulties in detail, reporting individual subject data and commenting on differences in profile and severity. For example, in the study by Mercury et al. (1995) of children with muscular dystrophy, the test shows that only those suffering from a particular type of deficit have fine motor difficulties. Another type of descriptive study uses the test to classify children into impaired and 'control' and then focuses on the characterization of a particular difficulty the children experience, such as fastening buttons, drawing or copying gestures (Bairstow & Laszlo, 1989; Barnett, 1994; Barnett & Henderson, 1992). Such characterization may extend beyond the motor domain to encompass the educational, social, and affective problems such children experience (e.g., Henderson et al., 1989; Schoemaker & Kalverboer, 1994).

In many descriptive studies, the TOMI/Movement ABC has been used alongside other perceptual-motor measures.

In addition to the studies specifically devoted to documenting the psychometric properties of the Movement ABC reported in Section 4 of this bibliography, these studies provide data on the validity of the TOMI/Movement ABC. Such measures include standardized tests such as the Perceptual-Motor Abilities Test (Henderson & Sugden, 1992), the Developmental Test of Visual-Motor Integration, the Sensory Integration and Praxis Tests, and

[4] This sub-chapter was presented, with minor corrections, after Barnett & Henderson (1998). An annotated Bibliography of Studies using the TOMI/Movement ABC: 1984–1996. section 1, Examining children's movement difficulties (pp. 15–37). Psychological Corporation, Harcourt Brace & Company Publishers.

nonverbal intelligence tests, as well as non-standardized ones, including button fastening and a range of graphic tasks (Barnett & Henderson, 1992).

Other studies have attempted to address specific questions concerning DCD by employing a more experimental approach. Although such studies can yield valid descriptive data, their primary focus has been to compare the performance of a group of children with DCD with a matched control group when specific task variables are manipulated.

Using tapping, drawing, and pointing tasks in these studies have investigated a range of factors, including visual memory (e.g., Dwyer & McKenzie, 1994), reaction time (Henderson et al., 1992), and the use of different types of feedback (van den Meulen et al., 1991a) in children with DCD. One study has looked specifically at ophthalmic factors in children with DCD (Mon-Williams et al., 1994). Most of the studies in this section involve children between 7 and 11, although some also include younger children. Thus, some studies have used all age bands of the test, whereas others have used only one or two.

Cermak (1986) studied the relationship between articulation disorders and motor coordination in children. This study examined the relationship between articulation disorder, soft neurological signs, and motor abilities. Fifteen children with articulation problems, as measured by the Templin-Darley Articulation Screening Test and a connected speech sample, were compared with a standard control group (matched for sex and age) on the Quick Neurological Screening Test, the Imitation of Postures Test (from the Southern California Sensory Integration Tests) and the TOMI. A significant difference was found between the groups on the TOMI and the Quick Neurological Screening Test, supporting the hypothesis that the children with articulation disorder would have more motor coordination problems and soft neurological signs than the average children in the control group. There was no between-group difference on the Imitation of Postures Test, suggesting that, as a group, children with articulation deficits are not "dyspraxic."This study supports other research findings positing a relationship between articulation problems and motor impairment, but it also indicates that this motor impairment is not necessarily "dyspraxia."

O'Brien et al. (1988) studied the relationship between visual-perceptual motor abilities and clumsiness in children with and without learning disabilities. One visual-perceptual test, four visual-motor tests, and a test of motor impairment were administered to 22 children with learning disabilities and 22 children without learning disabilities, aged 5 to 8 years. The children with learning disabilities were divided into "clumsy" and "non-clumsy" groups based on their motor impairment test scores. It was hypothesized that the clumsy children with learning disabilities would score significantly lower on visual-perceptual and visual-motor tests than the non-clumsy children with learning disabilities, who, in turn, would score significantly lower than those without learning disabilities. It was further hypothesized that there would be a significant correlation between clumsiness and the degree of visual-perceptual and visual-motor deficit. Analysis of the data indicated that, as expected, the clumsy children with learning disabilities scored significantly lower than the children without learning disabilities (the control group). There was no significant difference between the clumsy and non-clumsy children with learning disabilities or between the non-clumsy children with learning disabilities and the control group. The degree of clumsiness significantly correlated with scores on four of five tests. Results are discussed in terms of subtypes of learning disabilities and sample size.

Bairstow and Laszlo (1989) performed a study on deficits in the planning, control, and recall of hand movements in children with perceptual-motor dysfunction. A group of 40 children aged 7 to 11 years with perceptual-motor dysfunction were examined on two eye-hand coordination tasks: one requiring the interception on a television monitor of a moving target of variable speed and trajectory, the other requiring the tracking and recall of a target moving slowly in a circular path. Performance was compared to developmental norms. Results show that children with perceptual-motor dysfunction are heterogeneous and have various ways of carrying out motor actions. Some do not plan a movement; others do not control an ongoing movement like their peers. However, despite marked abnormalities, some children can compensate and be accurate. Kinesthetic disability is associated with motor disability. Process-orientated treatment - including kinesthetic training - improves motor functioning in some domains more than others.

Henderson et al. (1989) performed the study related to an exploratory study of goal-setting behavior, self-concept, and locus of control in children with movement difficulties. Eighteen children were referred to clinics because they lacked adequate motor competence, and 18 well-coordinated children were compared on measures of goal-setting, self-concept, and locus of control. The results showed that the children with movement difficulties were unrealistic in the way they set goals for themselves, had lower self-esteem, and were less inclined to accept responsibility for what might happen to them. However, the three different measures of self-regard did not correlate with one another.

Geuze and van Dellen (1990) performed a study on auditory processing during a movement sequence in 'clumsy' children. Perceptual anticipation was studied in a group of twelve 7 to 12-year-old 'clumsy' children and their matched controls by procuring them during a movement sequence. Procures were placed at several positions during the first fast goal-directed movement element to detect possible interference between the procure and the ongoing movement. Perceptual anticipation was measured as a decrease in the movement's reaction time (RT) to the next target. No difference between groups was found in the ability to profit from previous information. 'Clumsy' children were slower both in RT and movement time. Individual assessment of anticipation revealed that the seven-year-olds did not anticipate in the present groups. All of the older control children (N = 6) anticipated, whereas only 3 of 6 of the older 'clumsy' children anticipated. It is suggested that children who do not profit from preceding information have limited information processing capacity.

Murray et al. (1990) performed a study related to the relationship between form and space perception, constructional abilities, and clumsiness in children. The sensory integration and praxis tests (SIPT) (Ayres, 1989) were administered to 21 children with learning disabilities and 18 without learning disabilities, aged 5 to 8 years. The children with learning disabilities were divided into clumsy and non-clumsy groups based on their scores on the Test of Motor Impairment. It was hypothesized that the learning-disabled children in the clumsy group would score significantly lower than the learning-disabled children in the non-clumsy group on the six SIPT sub-tests that measure form and space perception and visual construction and that the non-clumsy learning-disabled children, in turn, would score significantly lower than the non-learning-disabled children. It was further hypothesized that there would be a significant correlation between the degree of clumsiness and the degree of visual-perceptual and constructional deficits. An analysis of the data indicated that both groups of learning-disabled children scored lower than the non-learning-disabled children on four of the six SIPT sub-tests. The clumsy and non-clumsy children with learning disabilities, however, differed from each other on only two sub-tests. The degree of clumsiness correlated significantly with three of the six sub-tests. The results are discussed regarding variations in perceptual and motor skills related to subtypes of learning disabilities.

Van den Meulen et al. (1991a) performed a study related to the visuomotor performance of standard and clumsy children concerned with arm-tracking with and without visual feedback. Tracking performance was investigated in normal and clumsy children aged six to seven and ten to eleven. Target signals moving unpredictably along a straight line had to be tracked with and without visual feedback. Performance was described in three ways: (1) performance in the low-frequency range; (2) the delay between target signal and tracking movement; and (3) a measure of tracking quality or overall similarity in the shape of target signal and tracking movement. Clumsy children in both age groups had a lower tracking quality and longer delay than normal children. Disturbances in attention regulation affect tracking

performance, particularly of the six- to seven-year-old clumsy children. There was no significant difference between standard and clumsy children in the effect of visual feedback on tracking performance. This suggests that clumsiness is not linked to disturbance of the integration of visual feedback information and motor processes.

Robinson (1991) performed a study on the causes and associations of severe and persistent specific speech and language disorders in children. Eighty-two school-age children with severe and persistent specific speech and language disorders were studied. Seventy-one had specific developmental language disorders, three had structural malformations (cleft palate), and eight had disorders acquired after a period of normal language development, including five with Landau-Kleffner syndrome. The sex ratio was 3.8 boys to one girl. Nearly half had a family history of speech-language disorder, with one in 5.2 affected siblings. Etiological factors were found in 26 percent: 11 percent prenatal, 3 percent prenatal, and 12 percent postnatal. Twenty-one percent had a seizure, and 7 percent had seizures after the age of eight. Twenty-nine percent were left-handed, 90 percent were clumsy, and 22 percent first walked after 18 months. The complex origins of specific speech and language disorders are discussed.

Barnett and Henderson (1992) performed a study related to some observations on the figure drawings of clumsy children. This paper presents two exploratory studies of figure drawing by clumsy children. In the first, the drawings of 42 children and controls were compared pair-wise on chronological age and Verbal IQ. Not only were the impaired children's drawings found to be generally delayed, but there was also a suggestion that some fell further behind their peers as they got older. A follow-up study of a subset of the clumsy group found that increasing delay was characteristic of some children, but others improved. Despite improvement in figure representation, the children's poor motor control persisted.

Maeland (1992a) performed a study related to handwriting and perceptual-motor skills in clumsy, "dysgraphic," and "'normal" children. Among various perceptual-motor tests, only visual-motor integration was significant in predicting the accuracy of handwriting performance for a total sample of 59 children consisting of 19 clumsy, 22 non-clumsy dysgraphic, and 18 'normal' children. They were selected from a sample of 360 fourth-graders (10-year-olds). For groups of clumsy and 'normal' children, the prediction of handwriting performance is difficult. However, correlations among scores on six measures showed that handwriting was significantly related to visual-motor integration, visual-form perception, and tracing in the total group and to visual-motor integration and visual-form perception in the clumsy group. The weakest correlations occurred between tests measuring simple psychomotor functions and handwriting. Moreover, clumsy children were expected to do poorly on tests measuring aiming, tracing, and visual-motor integration but not on tests measuring visual form perception and finger tapping. Dysgraphic children were expected to do poorly on visual-motor integration only.

Maeland (1992b) performed a study on identifying children with motor coordination problems. This study focuses on identifying children with motor coordination problems. It investigates whether the incidence of children with such problems in a regular school setting in Norway is comparable to that found in other countries using the same tests and criteria. The study also examines the level of agreement between two motor tests, the Test of Motor Proficiency (TMP) and the Test of Motor Impairment (TOMI), and teachers' judgment in identifying clumsiness among 360 10-year-old children. The results showed that while the three different assessment methods identified the same number of children with such problems (55.6%), each measure identified a somewhat different set of children. The lack of agreement demonstrates the difficulty in assessing subtle motor coordination problems or clumsiness.

Henderson et al. (1992) performed a study on reaction time and movement time in children with a developmental coordination disorder. Twelve children with Developmental Coordination Disorder (DCD) were matched pair-wise on chronological and reading age with twelve unimpaired children. Teachers' ratings provided an initial cue to motor status. However, the formal criterion for group membership was a score of 5 or more (DCD) vs. one or less (Control) on the Test of Motor Impairment (TOMI). The two groups were compared on an aiming task with two target sizes and a coincidence timing task. In the aiming task, simple reaction and movement times were significantly prolonged in the DCD group, and the trial-to-trial variability of movement times was more significant in DCD individuals. In coincidence timing, constant error did not distinguish between the groups, the overall tendency being to respond late. However, absolute error was significantly greater in the DCD group. The most robust chronometric effect for differentiating the two groups was movement time, with the smaller target. A multiple regression analysis using TOMI, chronological age, and reading,g age as predictors of movement time, showed that TOMI was a powerful indicator of movement time.

Maeland and Sovik (1993) performed a study on children with motor coordination problems and learning disabilities in reading, spelling, writing, and arithmetic. The present study investigated the incidence of motor coordination problems (clumsiness) among 10-year-old learning-disabled children and examined the characteristics of children with motor coordination problems. The most vital relationship between motor and learning problems existed in handwriting and arithmetic and the weakest in reading. About the assignment to different subgroups based on deficient reading and spelling strategies, more clumsy children with dyslexic problems were classified in the *'phonological'* and *'mixed'* groups than in the 'morphemic' group. This study also supports the heterogeneity of children labeled 'clumsy. The clumsy children varied widely in their characteristics and concomitant disabilities. No significant difference was found between the children with motor problems and a control group of 'normal' children when intelligence was considered.

Barnett and Henderson (1994) performed a study on button fastening as a prototype for manipulative action: Some observations on clumsiness. The manipulative skill of 42 Clumsy children aged 5-12 was assessed using a button fastening task. Speed and performance quality were compared to well-coordinated control children, matched pair-wise on age, gender, and verbal IQ. Children in the Clumsy group performed the task significantly more slowly than the control children. They also exhibited significantly more performance errors, as recorded on a concurrent observational checklist.

These included errors of motor control (poor posture and grip) and errors in how they responded to the particular demands of the task (being unable to locate the button and hole)—differences between the groups in terms of speed and performance quality diminished with age. A sub-set of sixteen Clumsy children was followed up using the same task after 18 months. Although there were some individual differences, improvements were found at the group level in both speed and performance quality. However, neither aspect had them 'caught up' with their well-coordinated peers. An examination of the individual performance errors revealed that some aspects had improved while others were more resistant to change.

Barnett (1994) performed a study on the graphic skills of 'Clumsy' children. This study examined the nature of the difficulties that 'Clumsy' children experience in a range of tasks involving the control of a writing implement. The performance of 16 Clumsy children was assessed on three graphic tasks: drawing a figure (Harris, 1963), drawing a triangle, and handwriting, compared to that of 16 well-coordinated control children. Composite scores from the three tasks indicated significantly poorer performance in the Clumsy group. Examination of the individual performance profiles revealed that all but one of the children who were 'Clumsy' were poor on the 'motor' aspects of performance, such as the quality of the drawn line. Performance on the 'perceptual' aspects of performance (like the size, shape, and proportions) was much more variable. Possible causes and implications of these difficulties are discussed.

Dussart (1994) performed an exploratory study on Identifying clumsy school children. This paper describes the development of a new checklist for teachers to identify children who might have

Developmental Coordination Disorder in the regular school population. Based on a wide range of behavioral symptoms, the final version of the checklist has two sections, one (A) containing 12 items most closely associated with DCD and another (B) containing 31 less frequently noted items. The concurrent validity of the checklist was examined using the TOMI, and a significant relationship was found. The checklist was used to assess whether incidence rates in East Kent are similar to those quoted in the literature and to test the hypotheses that there would be a relationship between (1) DCD and left-handedness and (2) DCD and self-concept.

Dwyer and McKenzie (1994) performed a study on the Impairment of visual memory in children who are 'Clumsy.' In order to evaluate the contribution of visual memory to problems in the development of motor coordination, 9-13-year-old boys who were 'clumsy' were tested on a graphic reproduction task under two delay conditions. Their performances were compared with those of well-coordinated control children. Individual geometric patterns were presented as a whole or sequentially, and children reproduced these patterns immediately after the inspection period or after a delay of 15 seconds. There was no difference in the accuracy of the reproductions of the two groups on immediate recall. After the 15-second delay, the reproductions of clumsy children were markedly less accurate, whereas those of the control children were unchanged. Although children who were 'clumsy' completed their reproductions more quickly, there was no correlation between their accuracy scores and response duration. It was concluded that a difference in visual rehearsal strategies may distinguish children who are 'clumsy' from their peers.

Geuze and Kalverboer (1994) performed a study related to Tapping a rhythm: A timing problem for children who are clumsy and dyslexic. This study is concerned with deficits in the ability to maintain an imposed rhythm in a tapping task and the possible sources of these deficits. Three groups of children between the ages of 7 and 12 with IQs above 75 participated: clumsy children, a dyslexic group, and a control group whose reading and coordination were considered age-appropriate. The children performed a series of "continuation" tapping tasks in which hand, speed, and tapping rhythm were manipulated. The performance measure taken was the tapping variability after the pacing signal ceased. When the three groups were compared, the clumsy children showed a slightly increased variability across all tasks but no sign of lateralized performance differences. In contrast, the children with dyslexia showed increased variability in only one task involving the right hand. The results of three different models of dysfunction are discussed.

Henderson et al. (1994) performed a study related to Visuospatial difficulties and clumsiness. Sixteen children with motor difficulties and 16 controls, matched on age, gender, and verbal IQ, were assessed on the Test of Motor Impairment, various graphic tasks, and a measure of visual-spatial discrimination. Poor perceptual and motor performance tended to co-occur. However, contrary to the visual-spatial deficit accounting for clumsiness, these abilities were uncorrelated even when attention was restricted to the less proficient children. There was no tendency for the control group's superiority in graphic reproduction to diminish when visual feedback was withheld. Some suggestions concerning more appropriate methods for framing and testing causal deficit hypotheses are offered.

Maeland et al. (1994) performed a study on Self-esteem in children with motor coordination problems (clumsy children). The purpose of the present study was twofold. Firstly, it examined whether there are differences between well-coordinated children and those with motor coordination problems concerning their perceived competence using the perceived competence scale for children (Harter, 1982). Secondly, it examined levels of self-competence in the cognitive and physical domains against actual levels of competence. Two groups of 19 children participated in the study, one with and one without coordination problems. On the Harter scale, the group with coordination problems had lower cognitive, social, physical, and general scores, but the difference between the groups was only significant for the physical domain. However, when the children's scores on the TOMI were considered, it was found that this difference was no more significant than could be explained by the difference in actual performance levels. The Clumsy children also performed more poorly than the well-coordinated children on reading, spelling, and arithmetic assessments. However, when this performance was compared to their scores on the cognitive domain of the Harter scale, it was found that the clumsy children overestimated their competence. This finding was significant for both reading and arithmetic.

Mon-Williams et al. (1994) performed a study related to Ophthalmic factors in developmental coordination disorder. This study aimed to examine ophthalmic function in children with Developmental Coordination Disorder (DCD). The ocular performance of 29 children with DCD and 29 randomly selected controls was assessed with five ophthalmic tests. No significant differences were found in visual status between the two groups. Strabismus was found in 5 children from both groups. All five children with strabismus from the DCD group showed a similar movement profile on the Movement ABC Checklist. While a causal relationship cannot be discounted, the presence of strabismus appears more likely to be a "hard" neurological sign of central damage typical to this group. The evidence indicates that a simple ophthalmic difficulty does not explain problems with movement control.

Piek and Coleman-Carman (1995) performed a study related to Kinesthetic sensitivity and motor performance of children with developmental coordination disorder. Earlier research has demonstrated some variables contributing to children's motor coordination problems (clumsiness). The present study examined the contribution of kinesthetic sensitivity in determining children's motor coordination levels. Twenty children with significant movement problems were compared with 20 control children matched for age, gender, and Verbal IQ. The kinesthetic perception and memory test from Laszlo and Bairstow's Kinesthetic Sensitivity test was a robust measure for distinguishing clumsy from control children. The authors' passive kinesthetic acuity test did not distinguish the two groups but did so when administered actively. These results indicate that future research on clumsiness in children should involve more complex tasks, as problems associated with the central translation processes may cause coordination difficulties in clumsy children.

Manjiviona and Prior (1995) performed a study on the Comparison of Asperger syndrome and high-functioning autistic children on a test of motor impairment. This study compared the levels of motor impairment of children with Asperger syndrome and those with high-functioning autism using a standardized test, the Test of Motor Impairment. The two groups did not differ on either total or sub-scale impairment scores. Intelligence level was negatively correlated with motor impairment, although the Asperger children mostly accounted for the relationship. There was considerable variability within both clinical groups, but 50% of Asperger children and 67% of autistic children showed a clinically significant level of motor impairment. Results offer no support for clumsiness as a diagnostically differentiating feature of these disorders.

Mercury et al. (1995) performed a study related to the Minor neurological and perceptual-motor deficits in children with congenital muscular dystrophy: Correlation with brain MRI changes. This study aimed to assess fine motor and perceptual-motor abilities in children with a "pure" form of congenital muscular dystrophy (CMD), in which there are no structural changes in the brain or severe mental retardation. Comparisons were made between those children with and without diffuse white matter changes on magnetic resonance imaging (MRI). Twenty-two children with "pure" CMD were investigated with a standard neurological examination and a battery of tests (the Manual Dexterity items from the Movement ABC, the test of visual-motor integration, and the Zurich Neuron-motor test). A significant difference was found for all the tests between the group of CMD children with normal MRI and the group with diffuse white matter changes. The manual dexterity and the Zurich Neuron-motor tests showed a greater sensitivity than the

test of visual-motor integration, which had some false negatives. Changes, contractures, or weakness did not affect the performance quality in the group with diffuse white matter. All these children scored abnormally on the test, irrespective of the severity or extent of contractures and weakness. In contrast, severe contractures and weakness in children with regular MRIs affected their performances. The results demonstrate that perceptual-motor difficulties and minor neurological soft signs are consistent in CMD children with diffuse MRI changes but not normal MRI. A more detailed neurological examination to detect these abnormalities may lead to more specific supportive help for these children's everyday lives and school performances. The concordance of the results with MRI findings suggests that these tests provide additional help in identifying subgroups of CMD.

Bouffard et al. (1996) performed the study related to A test of the activity deficit hypothesis with children with movement difficulties. This study aimed to test the hypothesis that children with movement difficulties are less physically active during playtime than age- and gender-matched controls without movement difficulties due to a deficit in overall activity levels. An observational study was conducted over two months in playground settings with 52 subjects. Findings revealed that during playtime, children with movement difficulties were vigorously active less often, played less often with large playground equipment, and spent less time in positive social interactions with others of their gender. Accordingly, it was concluded that the data supported the activity deficit hypothesis.

Schoemaker and Kalverboer (1994) performed a study on the Social and affective problems of clumsy children. This study aimed to examine the social and affective concomitants of clumsiness in children. The results suggest that clumsy children are more introverted than children without movement problems, judge themselves as less physically and socially competent, and are significantly more anxious. However, when the relationship between the severity of clumsiness and social or affective problems was examined, only socially harmful behavior was shown to be less common in the children who were most severely clumsy. Although some patterns were detected among social and affective problems, the overall picture was rather heterogeneous.

Schoemaker et al. (1994) performed a study related to Pattern drawing by clumsy children. Clumsy children frequently have problems executing fine and gross motor behaviors daily. Research thus far, however, has only addressed the problems these children have with discrete, goal-directed behaviors. The present study was concerned with the problems that clumsy children have when asked to perform a complex motor task that requires the execution of specific behaviors that are basic to the act of handwriting.

While the outcome of this work revealed no differences between clumsy and control children in preparation time prior to performing the task, substantial differences were noticed in the execution of the motor behaviors themselves. In particular, clumsy children were slower, less accurate, and less fluent when compared to control children. Discussion focuses on these findings' bearing on our understanding of the processes that clumsy children may employ when they engage in handwriting.

Sugden and Wann (1987) performed a study The assessing motor impairment in children with moderate learning difficulties. Two motor behavior tests examined the performance of 8-and 12-year-old children with moderate learning difficulties. On the Test of Motor Impairment, 50 percent of 8-year-olds and 29 percent of 12-year-olds had motor problems compared to 5 percent in an average population. The Test of Kinesthetic Sensitivity assessed the kinesthetic abilities of children, possibly offering explanations for the children's poor performance. On the Kinesthetic Acuity test, only seven out of 61 children reached the mean level score from the normative data, while on the Kinesthetic Memory test, 18 reached this level. There was a variable relationship between the two tests. The children who failed the Test of Motor Impairment scored poorer on both parts of the Test of Kinesthetic Sensitivity. However, the difference between these and the scores of the children who passed needed to be more significant to be predictive.

Van den Meulen et al. (1991b) performed a study on the Visuomotor performance of standard and clumsy children. The mechanisms underlying accuracy in fast goal-directed arm movements are estimated in normal and clumsy children in two age groups: (6 to 7) and (10–to 11) years. Clumsy children in both age groups had a more extended movement time than normal children; this difference increased slightly with visual feedback. For regular and clumsy children, the relative variability of the total distance moved was smaller than that of the distance moved during acceleration, indicating a variability reduction mechanism in the course of a movement. In the six-to-seven-year-old group, the relative variability of the distance moved during acceleration, and the total distance was more considerable for clumsy than normal children; this did not reach significance in the older group. The suggestion is that motor difficulties are linked to inaccuracy in open-loop control processes, and less efficient visual feedback may be used.

Wright and Sugden (1996) performed a study on The nature of developmental coordination disorder. The nature of developmental coordination disorder (DCD) was investigated in a selected group of Singaporean children aged 6-9 years using two methods: an inter-group comparison of children with DCD and matched controls (N = 69) and an intra-group study on the same children with DCD in the search for subtypes within this group. The results from the two approaches demonstrate that while the children with DCD are different from the control subjects, the difficulties seen within the DCD group are not expected of all the children. Four identifiable subtypes have been found within the children with DCD. More specific information gained about the difficulties children with DCD experience need to be established more quickly from the inter-group analysis, suggesting that the design of future intervention studies should incorporate differences found in subtypes of children with DCD.

Wright, H.C. & Sugden, D.A. (1996) performed a study related to A two-step procedure for identifying children with Developmental Coordination Disorder in Singapore. Developmental Coordination Disorder (DCD) prevalence among 6- to 9-year-old Singaporean primary school children was studied from a random sample (N = 427) through a two-step identification procedure within the Movement ABC. This two-step procedure's prevalence rate was 4% when the first step included the bottom 15% of the random sample. The two-step procedure moves towards fulfilling the diagnostic criteria for DCD set out by the American Psychiatric Association (DSM-IV) and the World Health Organization (ICD-10) of severe motor impairment in the development of motor coordination and significant interference with the activities of daily living not due to mental retardation or a known physical disability.

Conclusion

- This overview study introduces potential users to the early research conducted, primarily in developed countries, during the last decades of the twentieth century and the beginning of this.
- The motor development problems of children and youth with different types of disabilities are in scope.
- An overview of the available research can also serve as a good basis for progress in the current field of research in less developed countries.
- Problems in intellectual and motor development are interrelated, so this review presents various models and applied instruments in current research practice.
- This review study provides insight into research into different forms of disability, primarily in people with delayed intellectual and motor development.
- The presented works also deal with special education problems, which pedagogues now face in the general education of children and youth in primary and secondary education due to the modern approach to inclusive education.
- The presented works can serve as a model for improving the implementation of the educational process with sensitive groups of children with special needs.

References

Alibegović-Radžo, Dž., & Tulumović, Š. (2010). The influence of visual acuity on psychomotor skills of low vision children, part I. In J. Kovačević & V. Vučinić (Eds.), *Disabilities and disorders: Phenomenology, prevention and treatment* (pp. 173–181). Faculty of Special Education and Rehabilitation, University of Belgrade.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). American Psychiatric Publishing, Inc..

Andersen, L. B., Harro, M., Sardinha, L. B., Froberg, K., Ekelund, U., Brage, S., & Anderssen, S. A. (2006). Physical activity and clustered cardiovascular risk in children: A cross-sectional study (The European Youth Heart Study). *The Lancet*, *368*(9532), 299–304. https://doi.org/10.1016/S0140-6736(06)69075-2

Bäckman, E. (1988). Methods for measurement of muscle function. Methodological aspects, reference values for children, and clinical applications. *Scandinavian Journal of Rehabilitation Medicine. Supplement*, *20*, 9–95. Retrieved from https://pubmed.ncbi.nlm.nih.gov/3074485/

Bairstow, P. J., & Laszlo, J. I. (1989). Deficits in the planning, control and recall of hand movements, in children with perceptuo-motor dysfunction. *British Journal of Developmental Psychology*, *7*(3), 251–273. https://doi.org/10.1111/j.2044-835X.1989.tb00804.x

Barnett, A. (1994). Graphic skills of "clumsy" children. *Handwriting Review*, 104–112.

Barnett, A., & Henderson, S. E. (1992). Some observations in the figure drawings of clumsy children. *The British Journal of Educational Psychology*, *62*(3), 341–355. https://doi.org/10.1111/j.2044-8279.1992.tb01027.x

Barnett, A., & Henderson, S. E. (1994). Button fastening as a prototype for manipulative action: Some observations on clumsiness. In J. H. A. van Rossum & J. I. Laszlo (Eds.), *Motor development*: *Aspects of normal and delayed development* (pp. 99–115). VU University Press.

Barnett, A., & Henderson, S. E. (1998). *An annotated Bibliography of Studies using the TOMI/Movement ABC: 1984–1996. section 1, Examining children's movement difficulties* (pp. 15–37). Psychological Corporation, Harcourt Brace & Company Publishers.

Barona, A., & Faykus, S. P. (1992). Differential effects of sociocultural variables on special education eligibility categories. *Psychology in the Schools*, *29*(4), 313–320. https://doi.org/10.1002/1520-6807(199210)29:4

Bénéfice, E., Fouére, T., & Malina, R. M. (1999). Early nutritional history and motor performance of Senegalese children, 4–6 years of age. *Annals of Human Biology*, *26*(5), 443–455. https://doi.org/10.1080/030144699282561

Blair, S. N., Cheng, Y., & Holder, J. S. (2001). Is physical activity or physical fitness more important in defining health benefits? *Medicine and Science in Sports and Exercise*, *33*(6 Suppl), S379–S420. https://doi.org/10.1097/00005768-200106001-00007

Boreham, C., & Riddoch, C. (2001). The physical activity, fitness and health of children. *Journal of Sports Sciences*, *19*(12), 915–929. https://doi.org/10.1080/026404101317108426

Bouchard, C., Shephard, R. J., & Stephens, T. (1994). *Physical activity. Fitness, and health*. Human Kinetics Publishers.

Bouffard, M., Watkinson, E. J., Thompson, L. P., Dunn, J. L. C., & Romanow, S. K. E. (1996). A test of the activity deficit hypothesis with children with movement difficulties. *Adapted Physical Activity Quarterly*, *13*(1), 61–73. https://doi.org/10.1123/apaq.13.1.61

Bracken, B. A., & Fagan, Th. K. (1988). Abilities assessed by the K-ABC mental processing subtests: The perceptions of practitioners with varying degrees of experience. *Psychology in the Schools*, *25*(1), 22–34. https://doi.org/10.1002/1520-6807(198801)25:1

Brojčin, B., Glumbić, N., & Milačić-Vidojević, I. (2010). Behavioral and emotional problems of persons with intellectual disability. In J. Kovačević & V. Vučinić (Eds.), *Disabilities and disorders: Phenomenology, prevention and treatment* (pp. 349–364). Faculty of Special Education and Rehabilitation, University of Belgrade.

Buha-Đurović, N. (2010). Examining the relationship between executive functions and social behavior in children with mild intellectual disability, part II. In J. Kovačević & V. Vučinić (Eds.), *Disabilities and disorders: Phenomenology, prevention and treatment* (pp. 255–271). Faculty of Special Education and Rehabilitation, University of Belgrade.

Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports*, *100*(2), 126–131.

Čepička, V., Vlasakova, N., Mazanec, M., & Splitek, M. (2009). Stability of evaluation of gross motor skills at children with handicap. In *Proceedings of the International Conference Sport and Quality of Life*, *2009* (p. 28). Masaryk University of Brno.

Cermak, S. A., Ward, E. A., & Ward, L. M. (1986). The relationship between articulation disorders and motor coordination in children. *The American Journal of Occupational Therapy*, *40*(8), 546–550. https://doi.org/10.5014/ajot.40.8.546

Copley, J., & Ziviani, J. (2004). Barriers to the use of assistive technology for children with multiple disabilities. *Occupational Therapy International*, *11*(4), 229–243. https://doi.org/10.1002/oti.213

Davies, P. L., & Rose, J. D. (2000). Motor skills of typically developing adolescents: Awkwardness or improvement? *Physical and Occupational Therapy in Pediatrics*, *20*(1), 19–42. https://doi.org/10.1300/J006v20n01_03

DeOreo, K., & Keogh, J. (1983). Performance of fundamental motor tasks. In C. B. Corbin (Ed.), *A textbook of motor development* (pp. 76–91). Wm. C. Brown Company Publishers.

Dlouhy, M. (2008). The Influence of the Special Intervention Programme on the Development of the Attention and the Achievement Motivation of Young People with HEARing Handicaps. In *Proceedings of the International Conference Sport and Quality of Life*, *2008* (p. 35). Masaryk University of Brno.

Dobbins, D. A., Garron, R., & Rarick, G. L. (1981). The motor performance of educable mentally retarded and intellectually normal boys after covariate control for differences in body size. *Research Quarterly for Exercise and Sport*, *52*(1), 1–8. https://doi.org/10.1080/02701367.1981.10609289.

Dussart, G. (1994). Identifying the Clumsy child in school: An exploratory study. *British Journal of Special Education*, *21*(2), 81–86. https://doi.org/10.1111/j.1467-8578.1994.tb00095.x

Dwyer, C., & McKenzie, B. E. (1994). Impairment of visual memory in children who are clumsy. *Adapted Physical Activity Quarterly*, *11*(2), 179–189. https://doi.org/10.1123/apaq.11.2.179

Ekelund, U., Sardinha, L. B., Anderssen, S. A., Harro, M., Franks, P. W., Brage, S., Cooper, A. R., Andersen, L. B., Riddoch, C., & Froberg, K. (2004). Associations between objectively assessed physical activity and indicators of body fatness in 9- to 10-y-old European children: a population-based study from 4 distinct regions in Europe (the European Youth Heart Study). *The American Journal of Clinical Nutrition*, *80*(3), 584–590. https://doi.org/10.1093/ajcn/80.3.584

Fisher, A., Reilly, J. J., Kelly, L. A., Montgomery, C., Williamson, A., Paton, J. Y., & Grant, S. (2005). Fundamental movement skills and habitual physical activity in young children. *Medicine and Science in Sports and Exercise*, *37*(4), 684–688. https://doi.org/10.1249/01.mss.0000159138.48107.7d

Fjørtoft, I., Pedersen, A. V., Sigmundsson, H., & Vereijken, B. (2003). *Testing children's physical fitness – Developing a new test for 4–12 years old children*. (*Report* IS-1256). Norwegian Social and Health Ministry.

Forness, S. R. (1979). Clinical criteria for mainstreaming mildly handicapped children. *Psychology in the Schools*, *16*(4), 508–514. https://doi.org/10.1002/1520-6807(197910)16:4

Fratrić, F., & Rubin, P. (2006). Kvantitativne razlike u motoričkom statusu djevojčica i dječaka predškolskog uzrasta [Quantitative differences in the motor status of girls and boys preschool age]. In G. Bala (Ed.), *Antropološki status i tjelesna aktivnost djece i mladih* [Anthropological status and physical activity of children and youth] (pp. 51-56). Sad.

Gallahue, D. L., & Ozmun, J. C. (2006). *Understanding motor development: Infants, children, adolescents, adults* (6th ed.). McGraw-Hill.

Geuze, R. H., & Kalverboer, A. F. (1994). Tapping a rhythm: A problem of timing for children who are clumsy and dyslexic? *Adapted Physical Activity Quarterly*, *11*(2), 203–213. https://doi.org/10.1123/apaq.11.2.203

Geuze, R. H., & van Dellen, T. (1990). Auditory precise processing during a movement sequence in "clumsy" children. *Journal of Human Movement Studies*, *19*(1), 11–24.

Gligorović, M. (2010). Simultaneous cognitive processing in Children with mild intellectual disability. In J. Kovačević & V. Vučinić (Eds.), *Disabilities and disorders: Phenomenology, prevention and treatment. part II* (pp. 241–254). Faculty of Special Education and Rehabilitation, University of Belgrade.

Gredelj, M., Metikoš, D., Hošek, A., & Momirović, K. (1975). Model of the hierarchic structure of motor abilities. The results were obtained using a neoclassical method for estimating latent dimensions. *Kineziologija*, *5*(1–2), 8–81.

Greyerova, O., & Blahutkova, M. (2008). The influence of motor activities and changes in educational process of pupils with a minor mental retardation. In *Proceedings of the International Conference Sport and Quality of Life*, *2008* (p. 42). Masaryk University of Brno.

Gutin, B., Yin, Z., Humphries, M. C., & Barbeau, P. (2005). Relations of moderate and vigorous physical activity to fitness and fatness in adolescents. *The American Journal of Clinical Nutrition*, *81*(4), 746–750. https://doi.org/10.1093/ajcn/81.4.746

Haga, M. (2008). Physical fitness in children with movement difficulties. *Physiotherapy*, 94(3), 253–259. https://doi.org/10.1016/j.physio.2007.04.011

Hallal, P. C., Victora, C. G., Azevedo, M. R., & Wells, J. C. K. (2006). Adolescent physical activity and health: A systematic review. *Sports Medicine*, *36*(12), 1019–1030. https://doi.org/10.2165/00007256-200636120-00003

Harris, D. B. (1963). *Children's drawings as measures of intellectual maturity*. Brace & World, Inc.

Harter, S. (1982). The Perceived Competence Scale for Children. *Child Development*, *53*(1), 87–97. https://doi.org/10.2307/1129640

Havey, J. M. (1999). School psychologists' involvement in special education due process hearings. *Psychology in the Schools*, *36*(2), 117–123. https://doi.org/10.1002/(SICI)1520-6807(199903)36:2

Haywood, K. M., & Getchell, N. (2005). *Life span motor development* (4th ed.). Human Kinetics Publishers.

Henderson, L., Rose, P., & Henderson, S. E. (1992). Reaction time and movement time in children with a developmental coordination disorder. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *33*(5), 895–905. https://doi.org/10.1111/j.1469-7610.1992.tb01963.x

Henderson, S. E., & Sugden, D. (1992). *The movement assessment battery for children*. Psychological Corporation.

Henderson, S. E., Barnett, A., & Henderson, L. (1994). Visuospatial difficulties and clumsiness: On the interpretation of conjoined deficits. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *35*(5), 961–969. https://doi.org/10.1111/j.1469-7610.1994.tb02305.x

Henderson, S. E., May, D. S., & Umney, M. (1989). An exploratory study of goal-setting behaviour, self-concept and locus of control in children with movement difficulties. *European Journal of Special Needs Education*, *4*(1), 1–15. https://doi.org/10.1080/0885625890040101

Hessler, G. L., & Sosnowsky, W. P. (1979). A review of aptitude-treatment interaction studies with the handicapped. *Psychology in the Schools*, *16*(3), 388–394. https://doi.org/10.1002/1520-6807(197907)16:3

Horne, M. D. (1979). Attitudes and mainstreaming: A literature review for school psychologists. *Psychology in the Schools*, *16*(1), 61–67. https://doi.org/10.1002/1520-6807(197901)16:1

Hottinger, W. (1983). Early childhood. In C. B. Corbin (Ed.), *A textbook of motor development* (pp. 26–30). Wm. C. Brown Company Publishers.

Howley, E. T. (2001). Type of activity: Resistance, aerobic and leisure versus occupational physical activity. *Medicine and Science in Sports and Exercise*, *33*(6) Suppl., S364–9; discussion S419. https://doi.org/10.1097/00005768-200106001-00005

Humphrey, J. H. (1973, March 30-April 3). *The use of motor activity in the development of science concepts with mentally handicapped children* [Paper presention]. National Convention ofthe National Science Teachers Association, Detroit, Michigan.

Hung, H.-L., & Paul, P. V. (2006). Inclusion of students who are deaf or hard of hearing: Secondary school hearing students' perspectives. *Deafness and Education International*, *8*(2), 62–74. https://doi.org/10.1179/146431506790560229

Hyde, M., & Power, D. (2004). Inclusion of deaf students: An examination of definitions of inclusion in relation to findings of a recent Australian study of deaf students in regular classes. *Deafness and Education International*, *6*(2), 82–99. https://doi.org/10.1179/146431504790560564

Ilić, S., & Nikolić, S. (2010). Motor ability as a basis of psychomotor development of preschool children with disabilities. In J. Kovačević & V. Vučinić (Eds.), *Disabilities and disorders: Phenomenology, prevention and treatment* (pp. 79–92). Faculty of Special Education and Rehabilitation, University of Belgrade.

Ismail, A. H. (1976a). Integrirani razvoj: Teorija i eksperimentalni rezultati [Integrated development: Theory and experimental evidence]. *Kineziologija*, *6*(1–2), 7.

Ismail, A. H. (1976b). Delovanje dobro organiziranog programa fizičkog odgoja na intelektualni status [The effect of the well-organized physical education program on intellectual performance.]. *Kineziologija*, *6*(1–2), 29.

Ismail, A. H. (1976c). Povezanost između kognitivnih, motoričkih i konativnih karakteristika [Relationship between intellectual, motor and conative characteristics]. *Kineziologija*, *6*(1–2), 47.

Ismail, A. H., & Gruber, J. J. (1977). *Integrated development – Motor and intellectual performance*., Inc. Charles E. Merrill Books.

Ismail, A. H., & O'Dwyer, H. S. (1976). Uporedba normalne i lako mental no retardirane djece predadolescenata u motoričkim zadacima [Comparison Between Normal and Educable Mentally Retarded Preadolescent Children in Motor Performance]. *Kineziologija*, *6*(1–2), 117.

Ismail, A., & Gruber, J. (1965). The predictive power of coordination and balance items in estimating intellectual achievement. In *Proceedings of the First International Congress of Psychology of Sports*, Rome.

Japundža-Milisavljević, M., & Maćešić-Petrović, D. (2010). Productivity of verbal learning in children with mild intellectual disability, part I. In J. Kovačević & V. Vučinić (Eds.), *Disabilities and disorders: Phenomenology, prevention and treatment* (pp. 199–211). Faculty of Special Education and Rehabilitation, University of Belgrade.

Ješina, O. (2009). Centers of inclusion support adapted physical activity through adapted physical activity. In *Proceedings of the International Conference Sport and Quality of Life*, *2009* (p. 51). Masaryk University of Brno.

Kirkendall, D. R., & Ismail, A. H. (1976). Mogućnost razlikovanja triju grupa različitog intelektualnog statusa pomoću motoričkih varijabli. [The discriminating power of non-intellectual variables among three discrete intellectual groups]. *Kineziologija*, *6*(1–2), 59.

Kukolj, M. (1999). Motor functions as the basis for planning and programming of PE teaching. *Nastava i Vaspitanje*, *XLVIII*(1–2), 133–139.

Kukolj, M., Koprivica, V., & Ugarković, D. (2002). Interconnection of motor abilities of pupils of early school age in the periods of their significant changes. In R. Popović (Ed.), Collection of papers, 7th international scientific meeting—*FIS* communications-*Niš* (pp. 70–78). University of Niš.

Lightfoot, J., Mukherjee, S., & Sloper, P. (2001). Supporting pupils with special health needs in mainstream schools: Policy and practice. *Children and Society*, *15*(2), 57–69. https://doi.org/10.1002/chi.603

Maeland, A. F. (1992a). Handwriting and perceptual-motor skills in clumsy, dysgraphic, and 'normal' children. *Perceptual and Motor Skills*, *75*(3_Suppl), 1207–1217. https://doi.org/10.2466/pms.1992.75.3f.1207

Maeland, A. F. (1992b). Identification of children with motor coordination problems. *Adapted Physical Activity Quarterly*, *9*(4), 330-342. https://doi.org/10.1123/apaq.9.4.330

Maeland, A. F., & Sovik, N. (1993). Children with motor coordination problems and learning disabilities in reading, spelling, writing and arithmetic. *European Journal of Special Needs Education*, *8*(2), 81–98. https://doi.org/10.1080/0885625930080201

Maeland, A.F. (1994). Self-esteem in children with motor coordination problems (clumsy children). *Handwriting Review*, 128–133.

Maksimović, J., & Golubović, Š. (2010). Individualized education plans function for the development of the physical abilities of pupils with visual impairment. In J. Kovačević & V. Vučinić (Eds.), *Disabilities and disorders: Phenomenology, prevention and treatment* (pp. 149–161). Faculty of Special Education and Rehabilitation, University of Belgrade.

Manjiviona, J., & Prior, M. (1995). Comparison of Asperger syndrome and high-functioning autistic children on a test of motor impairment. *Journal of Autism and Developmental Disorders*, *25*(1), 23–39. https://doi.org/10.1007/BF02178165

Marsh, H. W. (1993). The multidimensional structure of physical fitness: Invariance over gender and age. *Research Quarterly for Exercise and Sport*, *64*(3), 256–273. https://doi.org/10.1080/02701367.1993.10608810

Mehrens, W. A., & Clarizio, H. F. (1993). Curriculum-based measurement: Conceptual and psychometric considerations. *Psychology in the Schools*, *30*(3), 241–254. https://doi.org/10.1002/1520-6807(199307)30:3

Mercury, E., Dubowitz, L., Berardinelli, A., Pennock, J., Jongmans, M., Henderson, S., Muntoni, F., Sewry, C., Philpot, J., & Dubowitz, V. (1995). Minor neurological and perceptuo-motor deficits in children with congenital muscular dystrophy: Correlation with brain MRI changes. *Neuropediatrics*, *26*(3), 156–162. https://doi.org/10.1055/s-2007-979746

Miloš, P. (2011). *The evaluation of motor development in elementary and secondary school children with intellectual disabilities* [Unpublished masters thesis]. Palacký University in Olomouc, Czechia.

Mon-Williams, M. A., Pascal, E., & Wann, J. P. (1994). Ophthalmic factors in developmental coordination disorder. *Adapted Physical Activity Quarterly*, *11*(2), 170–178. https://doi.org/10.1123/apaq.11.2.170

Morris, J., Abbott, D., & Ward, L. (2002). At home or away? An exploration of policy and practice in the placement of disabled children at residential schools. *Children and Society*, *16*(1), 3–16. https://doi.org/10.1002/chi.682

Murray, E. A., Cermak, S. A., & O'Brien, V. (1990). The relationship between form and space perception, constructional abilities, and clumsiness in children. *The American Journal of Occupational Therapy*, *44*(7), 623–628. https://doi.org/10.5014/ajot.44.7.623

O'Brien, V., Cermak, S. A., & Murray, E. (1988). The relationship between visual-perceptual motor abilities and clumsiness in children with and without learning disabilities. *The American Journal of Occupational Therapy*, *42*(6), 359–363. https://doi.org/10.5014/ajot.42.6.359

Okely, A. D., Booth, M. L., & Patterson, J. W. (2001). Relationship of physical activity to fundamental movement skills among adolescents. *Medicine and Science in Sports and Exercise*, *33*(11), 1899–1904. https://doi.org/10.1097/00005768-200111000-00015

Ozer, K., Ozer, D., Nalbant, S., Baran, F., & Top, C. E. (2008). The importance of sport in improving the quality of life of intellectual disabled children, "Akdeniz University" Sample. In *Proceedings of the International Conference Sport and Quality of Life*, *2008* (p. 109). Masaryk University of Brno.

Pejčić, A., & Malacko, J. (2005). The ontogenetic development of morphological characteristic and motor abilities of boys and girls in early elementary school. *Kinesiologica Slovenica*, *11*, 42–55.

Piek, J. P., & Coleman-Carman, R. (1995). Kinaesthetic sensitivity and motor performance of children with developmental co-ordination disorder. *Developmental Medicine and Child Neurology*, *37*(11), 976–984. https://doi.org/10.1111/j.1469-8749.1995.tb11952.x

Piek, J. P., Baynam, G. B., & Barrett, N. C. (2006). The relationship between fine and gross motor ability, self-perceptions and self-worth in children and adolescents. *Human Movement Science*, *25*(1), 65–75. https://doi.org/10.1016/j.humov.2005.10.011

Pišot, R. (2000). The analysis of the structure of six-and-a-half-year-old children's motor space in the light of its development as a whole. *Acta Universitatis Caroline, Kinanthropologica*, *36*, 67–78.

Powell, K. E., Caspersen, C. J., Koplan, J. P., & Ford, E. S. (1989). Physical activity and chronic diseases. *The American journal of clinical nutrition*, *49*(5 Suppl), 999–1006. https://doi.org/10.1093/ajcn/49.5.999

Prilleltensky, I., Nelson, G., & Peirson, L. (2001). The role of power and control in children's lives: An ecological analysis of pathways toward wellness, resilience and problems. *Journal of Community and Applied Social Psychology*, *11*(2), 143–158. https://doi.org/10.1002/casp.616

Reed, J. A., Metzker, A., & Phillips, D. A. (2004). Relationships between physical activity and motor skills in middle school children. *Perceptual and Motor Skills*, *99*(2), 483–494. https://doi.org/10.2466/pms.99.2.483-494

Rethazi, M., & Keeton Wilson, A. (1988). The Kaufman Assessment Battery for Children (K-ABC) in assessing learning-disabled children. *Psychology in the Schools*, *25*(4), 83–391.

Robinson, R. J. (1991). Causes and associations of severe and persistent specific speech and language disorders in children. *Developmental Medicine and Child Neurology*, *33*(11), 943–962. https://doi.org/10.1111/j.1469-8749.1991.tb14811.x

Rodić, N. (1999). *Effects of PE on differentiation of flexibility and power of pupils at lower elementary school levels according to gender and age.* In Effects of Different Teaching Models on Psychosomatic Status of Children and Youth [symposium]. Novi Sad, Serbia.

Rog, D. J. (1992). Child and Adolescent Mental Health Services: Evaluation challenges. *New Directions for Program Evaluation*, 1992(54), 5–16. https://doi.org/10.1002/ev.1604

Sari, H. (2005). An Analysis of the Relationship Between Identity Patterns of Turkish Deaf Adolescents and the Communication Modes Used in Special Residential Schools for the Hearing Impaired and Deaf. *Deafness and Education International*, *7*(4), 206–222. https://doi.org/10.1179/146431505790560329

Schoemaker, M. M., & Kalverboer, A. F. (1994). Social and affective problems of clumsy children: How early do they begin? *Adapted Physical Activity Quarterly*, *11*(2), 130–140. https://doi.org/10.1123/apaq.11.2.130

Schoemaker, M. M., Schellekens, J. M. H., Kalverboer, A. F., & Kooistra, L. (1994). Pattern drawing by clumsy children: A problem of movement control? In M. L. Simner, W. Hulstijn, & P. L. Girouard (Eds.) *Contemporary issues in the forensic, developmental and neurological aspects of handwriting*, *Toronto: Association of forensic document examiners*, *1* (pp. 45–64).

Scruggs, Th. E., & Mastropieri, M. A. (1995). Science and students with mental retardation: An analysis of curriculum features and learner characteristics. *Science Education*, *79*(3), 251–271. https://doi.org/10.1002/sce.3730790303

Southam-Gerow, M. A., & Kendall, P. C. PhC. (2000). Cognitive-behaviour therapy with youth: Advances, challenges, and future directions. *Clinical Psychology and Psychotherapy*, *7*(5), 343–366. https://doi.org/10.1002/1099-0879(200011)7:5

Stecker, P. M., Fuchs, L. S., & Fuchs, D. (2005). Using curriculum-based measurement to improve student achievement: Review of research. *Psychology in the Schools*, *42*(8), 795–819. https://doi.org/10.1002/pits.20113

Sugden, D. A., & Wann, C. (1987). The assessment of motor impairment in children with moderate learning difficulties. *The British Journal of Educational Psychology*, *57*(2), 225–236. https://doi.org/10.1111/j.2044-8279.1987.tb03156.x

Thompson, L., Boufford, E., Watkinson, J., & Causgrove Dunn, J. L. (1994). Teaching children with movement difficulties: Highlighting the need for individualized instruction in regular physical education. *Physical Education Review*, *17*, 152–159.

Valkova, H. (2009). Adapted physical activities – Challenge for research. In *Proceedings of the International Conference Sport and Quality of Life*, *2009* (p. 124). Masaryk University of Brno.

Van den Meulen, J. H. P., van den Gon, J. J., Gielen, C. C. A. M., Gooskens, R. H. J. M., & Willemse, J. (1991a). Visuomotor performance of standard and clumsy children (1st ed.): Fast oral-directed arm movements with and without visual feedback. *Developmental Medicine and Child Neurology*, *33*, 40–54.

Van den Meulen, J. H. P., van den Gon, J. J., Gielen, C. C. A. M., Gooskens, R. H. J. M., & Willemse, J. (1991b). Visuomotor performance of standard and clumsy children (2nd ed.): Arm-tracking with and without visual feedback. *Developmental Medicine and Child Neurology*, *33*, 118–129.

Winnick, J. P. (2005). *Adapted physical education and sport*. Human Kinetics Publishers.

World Health Organization. (1992). *The ICD-10 classification of mental and behavioural disorders: Clinical descriptions and diagnostic guidelines*. World Health Organization. https://iris.who.int/handle/10665/37958

Wright, H. C., & Sugden, D. A. (1996). A two-step procedure for the identification of children with developmental co-ordination disorder in Singapore. *Developmental Medicine & Child Neurology*, *38*(12), 1099-1105. https://doi.org/10.1111/j.1469-8749.1996.tb15073.x

Wright, H. C., & Sugden, D. A. (1996). The Nature of Developmental Coordination Disorder: Inter- and Intragroup Differences. *Adapted Physical Activity Quarterly*, *13*(4), 357–371. https://doi.org/10.1123/apaq.13.4.357

Wrotniak, B. H., Epstein, L. H., Dorn, J. M., Jones, K. E., & Kondilis, V. A. (2006). The relationship between motor proficiency and physical activity in children. *Pediatrics*, *118*(6), e1758–e1765. https://doi.org/10.1542/peds.2006-0742

Zentall, S. S. (2005). Theory- and evidence-based strategies for children with attentional problems. *Psychology in the Schools*, *42*(8), 821–836. https://doi.org/10.1002/pits.20114

Zurc, J., Pišot, R., & Strojnik, V. (2005). Gender differences in motor performance in 6.5-year-old children. *Kinesiologica Slovenica*, *11*(1), 90–104.

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