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Research Article

Assessment of the Motor Competencies Regarding Adapted Physical Activities

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Abstract

In the introduction, part authors give some of the histories of assessment in Adapted Physical Education (APE). There are currently 13 legally recognized disabilities. Inclusion has many meanings, but typically it is linked to the quality of life in the least restrictive environment and social competence, which is in line with the attitudes of individuals with and without disabilities. The fundamental principle of valuing diversity guides inclusion. Belonging, acceptance, and a sense of being supported are essentials of an inclusive environment. The most prevalent barriers to including students with disabilities are teacher preparation and teacher attitudes and perceived barriers to instruction consisting of equipment, programming, and time. Inclusion may impact internal and external factors, controlled and uncontrolled, and active and passive. People of all ages, types of disabilities, and experiences demonstrate individual differences in responding when facing similar situations in movement settings. An inclusive environment offers all individuals equally interesting, equally important, and similarly engaging tasks. An inclusive environment comprises the physical space and equipment, the social-emotional atmosphere, and the teaching strategies that are in use. The physical space should be barrier-free and include various equipment related to the lesson/activity. The social-emotional atmosphere should be free of stress, underlining cooperation rather than the existence of the fittest, fastest, or strongest. Teaching strategies should incorporate techniques that promote collaboration between instructor and learners, respond to different learning styles, encourage self-responsibility, provide opportunities for independent learning, and use various informal assessment tools to guide instruction.

Keywords: motor competence, physical fitness tests, evaluation, inclusion, APA

Introduction

In this part, the authors introduce the history of assessment in Adapted Physical Education: – APE Public Law 94-142, the Education for All Handicapped Children Act (IDEA, – 1975) was the grounding law that, for the first time in the history of education in the USA, provided all children aged 3-21 with disabilities the right to free, appropriate education. The Law has changed many times. Still, one of the fundamental aspects of that legislation is the concept that children with specific disabilities can qualify for special education services. There are, in general, 13 legally recognized disabilities. Among them are autism, speech or language impairment, deaf-blindness, hearing impairment, mental retardation, multiple disabilities, orthopedic impairment, other health impairment, serious emotional disturbance, specific learning disability, speech or language impairment, and traumatic brain injury, visual impairment, including blindness. Later on, grounding the desire to help disabled people follow the Americans with Disabilities Act (PL 101-336, section 504, ADA-1990). This act allowed the disabled population because disability is much broader. ADA includes conditions that substantially limit at least one significant life activity. IDEA eligibility requires a child to have a disability that unfavorably affects educational performance, while the ADA requires a child's disability to affect major life activities. Inclusion has many meanings, but typically it is linked to the quality of life in the least restrictive environment (LRE) and social competence, which is, connected with the attitudes of individuals with and without disabilities. The fundamental principle of valuing diversity guides inclusion. Belonging, acceptance, and a sense of being supported (belonging, acceptance) are essential for the essentials of an inclusive environment. The most prevalent barriers to including students with disabilities are teacher preparation and teacher attitudes and perceived barriers to instruction consisting of equipment, programming and time (Lieberman et al., 2002; Jovanović et al., 2014).

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The home country school (Serbia Republic) goes through a phase of profound innovation from the cultural, teaching, and organizational points of view. The reference for each subject for the curriculum structure is provided by the National Guidelines (Popović et al., 2016). The planning based on competencies in the school curriculum brings about a considerable and methodological change that emphasizes the training value of movement activities. Every movement experience done by the pupil, beyond the practical dimension, requires the awareness of the experience done and of its consequence, including the command of the concepts, terms and definitions, the application in varied contexts of skills and knowledge. The meanings of body-awareness and movement experience during the development age belong, from the epistemological point of view, to different scientific fields that represent the basis for defining the training aims.

The use of the term 'competence,' connected with the practical-motor domain of the person, reflects epistemological delays, uncertainties, confusion, and contradictions with evident consequences in the field of teaching, on the evolution of the learning processes within the teaching continuity and the inter-subject links. Motor competence can be conceptualized as a person's ability to execute different motor acts, including coordination of both fine (manual dexterity) and gross motor skills (static and dynamic balance), after Henderson & Sugden (1992).

Motor competence is essential for different aspects of development in children and adolescents (Piek et al., 2006). Some of the existing tests for motor competence-Movement Assessment Battery for Children 2nd ed. (MABC-2) 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 tests demand little muscular strength and endurance, flexibility, and aerobic performance (Henderson et al., 2007).

The interaction between one's health-related fitness, performance-related fitness, and motor abilities is evident. Whenever performing movement activities, varying degrees of these components are required. It is difficult, if not impossible, to obtain a pure measure of essential elements in physical fitness. Even in test and laboratory settings, only an indirect indication of the different crucial components is possible (Gallahue et al., 2012).

However, some can argue that measuring physical fitness is different from measuring motor competence because it includes the so-called health-related components such as endurance, strength, flexibility, and body composition (Fjørtoft et al., 2011; Haga, 2008a). These four mentioned here are the essential systems; a systematic program of exercise aimed at these components can improve physical fitness (Haywood & Getchell, 2005).

Previous studies showed that physically skillful children are more physically active (Reed et al., 2004) and that there is a close link between habitual physical activity and motor proficiency (Okely et al., 2001; Thompson et al., 1994; Wrotniak et al., 2006). Longitudinal studies have shown that children with low motor competence are less physically active than children with higher motor competence, and this tendency continues through adolescence and adulthood (Henderson et al., 2007; Hands, 2008).

As a consequence, insufficient physical activity in children with low motor competence is in relation to poor performance levels on particular components of physical fitness, such as cardiovascular endurance, muscular strength, and speed (Haga, 2008a; Hands, 2008). On the other hand, the results from studies that explored the relationship between physical activity and motor competence agree that these variables are not strongly related (Fisher et al., 2005; Okely et al., 2001; Olesen et al., 2014; Reed et al., 2004).

The relationship between motor competence, physical fitness, and physical activity in children is well documented in previous studies. Better understanding the nature of this relationship could help maintain and develop sufficient physical fitness and motor competence in children, potentially significant contributors to their health and well-being (Schmutz et al., 2020).

Short Review of Selected Studies in Physical Activity, Cognitive and Motor Abilities

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. This theoretical review aimed at the assessment of motor competence and physical fitness test regarding physical activity in different populations.

Motor functions are directly in relation to cognitive and affective functions of a personality, particularly in the period of early school age, so without the significant impulse of motor development, it is not possible to realize the idea of the necessity of integral development of pupils. The results of the research on the influence of physical exercise point that changes in the development of certain body functions are possible, especially in the periods of natural increase of their functions, 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 with age (Davies & Rose, 2000). Recently, a certain number of researches appeared dealing with the influence of gender on the structure of motor abilities. Based on the results of such research, the structure of motor abilities does not change in the course of life, i.e., it is common for males and females (Fratrić & Rubin, 2006; Marsh, 1993). However, in certain studies which are 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 strength of the test (Backman, 1988; 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, 2001; Hottinger, 1983).

On the other hand, there are other authors who have found no significant gender differences in motor abilities from the youngster's age of seven to that of twelve (DeOreo & Keogh, 1983; Kukolj, 1999). The results of the research on pre-school 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 between them (Fratrić & Rubin, 2006).

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, which point out that group of children with cerebral damage have 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 (Ismail, 1976).

Definition and Problem

Physical activity is defined as any bodily movement produced by skeletal muscle resulting in a substantial increase in resting energy expenditure (Bouchard et al., 1994). 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). The individual's physical activity pattern over recent weeks and months is the primary determinant of physical fitness (Blair et al., 2001), defined as a set of inherent or achieved personal attributes related to performing physical activity.

The components of physical fitness may be subdivided into two groups: health-related fitness and skill/performance-related fitness. Most experts agree that the elements of health-related fitness include aerobic functioning or cardio-respiratory endurance, body composition, muscular strength, muscular endurance, and flexibility. The components of skill-related physical fitness (also known as performance-related fitness) generally include balance, coordination, speed, agility, power, and reaction time, reflecting the performance aspect of physical fitness (Howley, 2001). As these definitions suggest, relations exist between health-related physical fitness, physical activity, and health. In essence, each of these areas can influence, and be influenced by, each of the others. For example, physical activity and physical fitness

increases can contribute to positive health status. Everyday activities require that children master different motor skills (Henderson & Sugden, 1992). Among these are the skills essential to biological functioning like crawling, walking, and running and those required for adequate social functioning, like dressing and playing. Generally, motor competence test items demand little muscular strength and endurance, flexibility, aerobic performance, etc. The interaction between one's health-related fitness, performance-related fitness, and motor abilities is evident.

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. The primary aim of physical education is to utilize an organized process of schooling that carries out a positive influence on the psycho-somatic status of school children. And to use the transformations at the somatic level to correct the result of biological factors that were insufficient during intense growth and development.

Objectives

The main objective of this study was to present various instruments for estimating motor competence (motor development, physical fitness) which are appropriate for the general population, as well as for the individuals with special needs. According to literature review of previous research findings, authors have selected as the most appropriate Physical Fitness Test (PFT), according to Fjørtoft et al. (2011), the test battery that is functional and easy to administer. Based on the application of the .08above-mentioned test battery the actual research will provide the gender, and grade level differences in motor development, through (PFT) results performed in school-age children (boys and girls) with intellectual disabilities.

Methodology

The TOMI/Movement ABC is applied in many studies that examine children's motor performance. These can divide 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 problems. The majority of these studies have focused 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), or Specific Developmental Disorder of Motor Function (SDDMF). These are children who have considerable difficulties performing everyday movement tasks without any obvious sensory, physical or neurological disorder. Occasionally, the children of interest suffer from a specific and isolated difficulty, such as a handwriting problem. The test is also in use with two other groups of children, those who suffer from an identified medical condition affecting motor performance and those in whom the primary difficulty lies in some different realm, such as language or attention, but whose parallel motor difficulties are of general concern. Two of the most crucial personal strengths of individuals with disabilities and successful inclusion are high self-efficacy and high goal perspective.

Individuals with high self-efficacy and goal perspective would most likely insist on being included, modify the task to meet personal needs and goals, and suggest ways the teacher or coach could help. Above all, teachers and coaches need to remember that not all individuals with disabilities approach situations and interactions in the inclusion environment in the same ways.

Inclusion is mediated by internal and external factors, controlled and uncontrolled, and active and passive. People of all ages, types of disabilities, and experiences demonstrate individual differences in responding when experiencing similar situations in movement settings. Creating physical activity environments that respect diversity and encourage personal improvement are the best approaches to the design of successful inclusion. An inclusive environment offers all individuals equally interesting, equally important, and similarly engaging tasks. An inclusive environment comprises the physical space and equipment, the social-emotional atmosphere, and the teaching strategies that are in use.

The physical space should be barrier-free and include various equipment related to the lesson/activity. The social-emotional atmosphere should be free of stress, emphasizing cooperation rather than survival of the fittest, fastest, or strongest. Teaching strategies should incorporate techniques that promote collaboration between instructor and learners, respond to different learning styles, encourage self-responsibility, provide opportunities for independent learning, and use various informal assessment tools to guide instruction. Movement performance is expressed on numerous levels of competence and awareness.

Furthermore, a movement ability includes the pupil's behaviors and attitudes, which take along dynamic projects, choices, practical decisions, and self-evaluation of the process and its result. Typical of the training process is promoting the self-evaluation ability of the level of competence reached by each pupil, due to two main reasons: motivate and support the learning of competencies of their learning (meta-knowledge), and the analysis of the progress reached is a reinforcement of the learning process as a whole. A movement competence cannot be separated from a group of performances related to the same subject.

Moreover, represent the indicators of the presence and the level reached. When a pupil does not manage to perform an expected movement task (ex. jumping, basket, turning, and so on), therefore, it does not express the absence of competence but its level and becomes an opportunity for the teacher to go back to the teaching process, for ex.: the presence of coordinate deficits, to the degree of motivation of the pupil, to the cooperation within the group, to the type of communication used, to the time of movement commitment.

The testing and evaluation process includes the control of the performance and the performing techniques, that is, of the arrangements that he can make and the problems he can sort out. Still, he will have to go ahead pointing out the coordinative abilities and knowledge styles the pupil has. Therefore, from the point of view of testing and evaluation, it is essential to underline that the methods are varied and necessary to each other, using a set of tests not only practical but also theoretical to provide the student and the teacher with organized information and control the level of the teaching process and the self-evaluation of the following procedures:

(1) Constant analysis and definition of the testing criteria through lists of precise descriptions of movement learning and of categories to classify attitudes; (2) The description of the development, pointing out the sequence and the type of experience, the most frequent mistakes, the improvements, the order of tasks, the possible improvements; (3) The structured and half-structured tests of knowledge; (4) The use of testing for the control of conditional movement abilities.

The teaching based on movement competencies brings about a meaningful transformation of the evaluating procedures. In other words, we should go from traditional testing to an evaluation of isolated factors of the performance (coordinative abilities, conditional ones, movement abilities, knowledge, attitudes), to a comparative and non-comparative system based on both quantity and quality, the relationship between pupil-group and pupil before and after the teaching process.

Assessment decisions involve testing, measuring, and evaluating individual performance and environmental support systems. Therefore, understand factors that influence how a child performs in a specific assessment process. For instance, a child can have limited endurance that hinders him from finishing the whole testing battery at once or cannot understand the given task. So when someone is assessing the child, one should realize how the child's abilities/disabilities affect the result in a given job. According to (Block, 2000; Horvath et al., 2002; Kelly, 1989), the key is in finding out as much as possible about each child from the teachers, parents, and other relevant persons to ensure that testing is valid and accurate. Assessment is not an easy task, and it is divided into several sections.

Identification decisions which may also be referred to as eligibility or classification decisions, involve determining whether a child's level of performance warrants special attention. For example, this could involve deciding whether a student's physical fitness performance is good enough to qualify for a national physical fitness, determining whether the deficits in children's physical and motor abilities qualify them to receive special education services,

and determining what sport classification is needed for participation in a disabled sports event. In each case, there are established rules that govern how performance must be assessed and qualifying standards that must be met (Block, 2000; Horvath et al., 2002; Kelly, 1989). Norm-Referenced Instruments (NRI) are standardized tests designed to collect performance data that are then compared with reference standards composed of normative data provided with the instrument. NRI is typically used when making identification decisions because they provide normative interpretative data that can show the magnitude of the differences found in a student's performance compared with standards.

Placement decisions Placement decisions involve determining the programmatic needs of the student and the most appropriate instructional setting for addressing these needs. For students with disabilities, this means choosing the most suitable and least restrictive environment where the physical education goals in their Individual Educational Programs (IEP) can be addressed and achieved. Placement is a two-part decision.

First, the child's needs must be identified, and a program defined to address these needs. The annual goals and short-term objectives for this program make up the IEP. Therefore, before instruction, determine what the student needs to learn and the content someone plan to teach and choose an assessment instrument designed to measure how to perform that behavior.

Second, a decision must be made regarding where this program will be implemented. Although both NRI and CRI can be used when making placement decisions, CRI is more commonly administered because they provide information that can be used to inform the placement decision, formulate goals for the IEP, and plan initial instruction (Block, 2000; Horvath et al., 2002; Kelly1989). Therefore, use this initial assessment data to identify learning needs and create appropriate learning activities and instructional groups to address these needs.

Finally, continually assess during instruction to provide children with relevant feedback, evaluate the effectiveness of someone learning activities, and ensure that children are on task and working on the appropriate component of the skill component- based on their assessed needs (Block, 2000; Horvath et al., 2002; Kelly, 1989).

The most prevalent barriers to the inclusion of students with disabilities are teacher preparation and attitudes and supposed and actual obstacles to instruction that can include equipment, programming, and time. Inclusion is mediated by internal and external factors, controlled and uncontrolled, and active and passive.

People of all ages, types of disabilities, and experiences demonstrate individual differences in responding when experiencing similar situations in movement settings. Creating physical activity environments that respect diversity and encourage personal improvement is the best approach to the design of successful inclusion. An inclusive environment offers all individuals equally interesting, equally important, and equally engaging tasks. An inclusive environment comprises the physical space and equipment, the social-emotional atmosphere, and the teaching strategies used.

The Motor Development Assessment Process

Motor skills assessment is the first and vital part of the assessment process. It is a development of fundamental motor patterns. Motor skills are usually divided into two categories: a) locomotors skills and b) object control skills. Typical locomotors skills are running, galloping, jumping, sliding, hop, and skipping. Typical object control skills include the throw, catch, strike, kick, and dribble (Sherrill, 1998). Tests on fundamental motor patterns tend to focus on the qualitative aspects of each skill rather than on the outcome of the skill. There are many different tests to assess motor skills and TGMD (Test of Gross Motor Development), and an individually administered norm - and criterion is one of them – a referenced test that measures the gross motor functioning of children 3 to 10 years of age. Motor abilities also include balance, postural control, agility, bilateral coordination, eye-hand, eye-foot coordination, dexterity (fine motor skills), and specific types of strength and flexibility needed for successful motor skill performance (Block, 2000; Horvath, 2002; Kelly, 1989). Several internationally recognized and standardized assessments of movement skills exist and are widely used in literature and practice to assess the motor performance of children and adolescents. The Movement Assessment Battery for Children- 2nd edition (MABC-2; than Bruininks-Oseretsky Test of Motor Proficiency- 2nd edition (BOT-2; or Test of Gross Motor Development- 3rd edition (TGMD3; are the most frequently mentioned in contemporary research in pre-school children Bruininks, 1978; Henderson et al., 2007). These tests have a broad application in physical therapy, psychology, and adaptive physical education and are used as research tools. All tests monitor motor efficiency by assessing motor competence and helping decision-making adapt various programs for children. However, they differ, and it is good to know their proprieties before selecting the tool for evaluation or targeted intervention programs.

The BOT-2 test. This is the newest version of BOT (Bruininks, 1978) that has been designed to assess the fine and gross motor skills of children 4 through 21 years of age. Unlike other tests, this test has long and short forms. Long-form measure in 4 areas with eight subtests and 53 tasks in fine manual control, manual coordination, body coordination, and strength and agility. The long-form is the most reliable and comprehensive measure of motor proficiency, taking 40 to 60 minutes for administration. The Brief-form of the test consists of 8 subtests and 13 tasks, which assess fine motor precision and integration, manual dexterity, bilateral coordination, balance, speed and agility, upper-limb coordination, and strength. The short version is easier to use in screening, program evaluation, and research (administrations take 15 to 20 minutes). The extended version is more suitable for need if suspected of motor problems. The correlations between the two forms range from .82 to .87. The scoring system is organized from descriptive categories: total point scores converted to standard scores and percentile rank regarding age and gender. Combined norms are referenced in the manual too.

The TGMD-3 test. The revised version of TGMD and TGMD-2, are standardized, criterion-referenced, valid, and reliable gross motor assessments for children aged 3–10 years and 11 months. The TGMD-2 measures 12 motor skills across two subscales: locomotors (run, gallop, hop, leap, jump, and slide) and object control (throw, catch, kick, strike, roll, and dribble) skills. As could be noticed, the age range here is limited compared to the two other tests and does not assess fine motor skills, i.e., manual dexterity. The scoring system is similar. Each skill ranges from 6 to 10 points, depending on the task. Each skill within a subscale is then summed for a raw skill subscale score. Each subscale can be combined for an overall gross motor fundamental skill score. Raw scores for locomotors and object control and general gross motor can be converted into standard scores and percentile ranks based on age and sex.

The MABC-2 test. Henderson et al. (2007) is the latest version reversed from older versions of Test of Motor Impairment and MABC (Henderson & Sugden, 1992). Unlike the other two tests, the MABC-2 kit has two components for gathering information checklist and a performance test, supplemented with guidelines ecological intervention program. An inventory is a form of a questionnaire about everyday tasks. It is intended for, i.e., parents and teachers, to rate the child's non-motor and motor competence in predictable and unpredictable environments. A psychologist most often applies it in educational settings. The MABC-2 performance test assesses the three motor domains: Manual dexterity, aiming & catching, and balance within eight test items. Unlike the other two tests, tasks differ in age bands: 3–6 years old, 7–10 years old, and 11-16 years. Furthermore, there are no sex-separated norms. The raw score can be converted to a standard score (SS) provided for each age group for every item. Component scores (CS) for domains and Total test scores are uniform, and they can be used to compare throughout the different age ranges. Đorđević et al. (2020) said that SS tests and scaling that differ between age groups can cause difficulties with longitudinal analysis of individuals for research purposes or ongoing evaluation. Accordingly to the Manual norms, the TTS can be converted to a percentile score (Henderson et al., 2007) and a traffic light system that describes a child's motor competence level. A score at or below the 5th percentile is classified as the red zone indicating a significant difficulty in movement. A score between the 5th and 16th percentile is classified as the amber zone, meaning a

possible risk of movement difficulty. From the 25th percentile to the 99.9 percentile, this score is ranked as the green zone of a typically developed child. The mean norm score is SS 10 with a standard deviation of 3.

Components of physical fitness. Physical fitness performs occupational, recreational, and daily activities without becoming overly tired. So here is what is needed to assess: Cardio-respiratory endurance, muscle-skeletal fitness, body weight, body composition, flexibility. Cardio-respiratory endurance is the ability of the heart, lungs, and circulatory system to supply oxygen and nutrients efficiently to working muscles. Improved cardio-respiratory endurance is one of the essential benefits of aerobic exercise training programs. Muscle-skeletal fitness refers to the ability of the skeletal and muscular systems to perform work. Bodyweight refers to the size or mass of the individual. Body composition relates to body weight regarding the absolute and relative amounts of muscle, bone, and fat tissues (Heyward & Gibson, 2014). Aerobic exercises are effective in altering body weight and composition. Flexibility refers to the ability to move a joint or series of joints fluidly through the complete range of motion (Heyward & Gibson, 2014). It can be limited by bone, the structure of the joint, and the size and strength of the muscles, ligaments, and other connective tissues.

Purposes of physical fitness. A teacher assessing can use laboratory and field tests to assess each component of physical fitness and develop physical fitness profiles for students. Results from these tests enable one to identify strengths and weaknesses and to set realistic goals for the student. When using a complete battery of physical fitness tests in a single session, it is recommended to use the following test sequences to minimize the effects of previous tests on subsequent test performance: resting blood pressure and heart rate, body composition, cardio-respiratory endurance, muscular fitness, and flexibility.

Test validity, reliability, and objectivity. Test validity is the ability of a test to measure accurately, with minimal error, a specific physical fitness component. Reference or criterion methods are used to obtain direct measures of physical fitness components. Test reliability is the ability of a test to produce consistent and stable scores across trials and over time. Objective tests make similar test scores when different technicians administer the same test for a given individual. Objectivity is measured by calculating the correlation between pairs of test scores measured on the same individuals by two other technicians.

Evaluation. Although reference measures obtained in the laboratory setting provide the most valid assessment of each physical fitness component, these tests are expensive and time-consuming and require considerable technical expertise. In infield test settings, someone can obtain estimates of these reference measures by selecting valid field tests with good predictive accuracy.

Strength and muscular endurance assessment. Measures of strength and endurance are used to establish baseline values before training, monitor progress during training, and assess the overall effectiveness of resistance training and exercise rehabilitation programs. Static strength and muscular endurance are measured using dynamometers.

Isometric muscle testing. Someone can use isometric dynamometers to measure static strength and endurance of the grip squeezing muscles and leg and back muscles.

Assessing flexibility. Flexibility is important, often ignored, the component of health-related fitness. Adequate levels of flexibility are needed to maintain functional independence and perform activities of daily living, such as bending to pick up a newspaper or getting out of the back seat of a two-door car. Flexibility is the ability of a joint, or series of joints, to move through a full range of motion without injury. Flexibility is related to body type, age, gender, and physical activity level. To assess a student's flexibility, the teacher should select several test items because of the peculiar nature of flexibility: (1) Client performs a general warm-up followed by static stretching before the test and need to avoid fast movements and stretch beyond the pain-free range of joint motion; (2) Administer three trials of each test item; (3) Compare the client's best score to norms to obtain a flexibility rating for each test item; (4) Use the test results to identify if joints and muscle groups needing improvement. For example, in the "sit-and-reach" test: instruct the student to sit down on the floor and then reach forward slowly and as far as possible while keeping the two hands parallel. Ensure that the knees do not flex and that the student avoids leading with one hand.

Motives for physical activity measure. It is concerned with people's reasons for participating in physical activities such as exercise, aerobics, general gymnastics, weight lifting, and various team sports. MPM-Revised is a questionnaire intended to assess the strength of five motives for participating in physical activities: (1) Fitness**,** which refers to being physically active out of the desire to be physically healthy and to be strong and energetic; (2) Appearance, which refers to being physically active to become more physically attractive, to have defined muscles, to look better, and to achieve or maintain the desired weight; (3) Competence/Challenge, which refers to being physically active because of the desire to improve at an activity, to meet a challenge, and to acquire new skills; (4) Social, which refers to being physically active to be with friends and meet new people; and (5) Enjoyment refers to being physically active just because it is fun, makes you happy, and is engaging, stimulating, and enjoyable. Scale Description: The scale has been used to predict various behavioral outcomes, such as attendance, persistence, or maintained participation in some sport or exercise activity, or to predict mental health and well-being. The different motives are associated with different outcomes.

Table 1
Norm Reference Data for Plate Tapping Test in Females

			Females		
%	<8	8 -31	32 - 68	69 - 92	>92
Age	Extremely below average	Below average	Average	Above average	Extremely above average
10	> 18.2	16.2 – 18.2	14.9 – 16.1	11.8 – 13.9	< 11.8
11	> 16.2	14.7 – 16.2	13.1 – 14.6	11.5 – 13.3	< 11.5
12	> 14.5	13.2 – 14.5	11.9 – 13.1	10.5 – 11.8	< 10.5
13	> 14.5	13.2 – 14.5	11.8 – 13.1	10.4 – 11.7	< 10.4
14	> 14.1	12.2 – 13.4	10.8 – 12.1	9.5 – 107	< 9.5
15-18	> 12.1	11.9 – 12.1	10.5 – 11.8	9.3 – 10.4	< 9.3

Table 2
Norm Reference Data for Plate Tapping Test in Males

			Males		
%	<8	8 -31	32 - 68	69 - 92	>92
Age	Extremely below average	Below average	Average	Above average	Extremely above average
10	> 18.6	16.2 – 18.6	13.7 – 16.1	11.1 – 13.6	< 11.8
11	> 17.6	15.5 – 17.6	13.4 – 15.4	11.2 – 13.3	< 11.5
12	> 14.9	13.5 – 14.9	11.9 – 13.4	10.3 – 11.8	< 10.5
13	> 15.1	13.5 – 15.1	11.8 – 13.4	10.2 – 11.7	< 10.4
14	> 14.1	12.4 – 14.1	10.6 – 12.3	8.8 – 10.5	< 9.5
15-18	> 13.2	11.7 – 13.2	10.2 – 11.6	8.6 – 10.1	< 9.3

This test has reference values for children and adolescents aged 10–18. It is currently being used to identify disorders in movement speed and fluency of students with intellectual disability, girls with short stature, elderly persons, and those with neurological conditions such as Parkinson's disease. Table 1 presented Norm reference data (based on results of 8373 participants). This test of limb movement speed is part of the Eurofit Testing Battery. The following description is based on Fitness Testing from Topendsports with some additional information: a) purpose (to assess the speed and the coordination of limb movement), b) equipment required: table (adjustable height), yellow discs (20cm diameter), rectangle (30 x 20 cm), and stopwatch, c) description/procedure: If possible, the table height should be adjusted so that the subject is standing comfortably in front of the discs. Two yellow discs are placed 60 cm apart on the table with their centers. The rectangle is placed equidistant between both discs. The non-preferred hand is placed on the rectangle. The subject moves the preferred hand back and forth between the discs over the arrow in the middle as quickly as possible. This action is repeated for 25 complete cycles (50 taps).

Physical Fitness Test (**PFT).** This is a relatively new test battery that aims to provide a reliable, objective quantification of children's physical fitness levels (Fjørtoft et al., 2003; Haga, 2008b). It consists of activities included in most children's everyday play activities, e.g., *jumping, throwing, running, and climbing*. The battery consists of nine test items: (3) three based on jumping, (2) two on throwing, (1) one on climbing, and (3) three on running. The most test items are also included in other measures such as the EUROFIT (Adam et al., 1998), the Allgemeiner Sportsmotorischer Test 6–11 (Bös & Wohlman, 1987), the Erfarenheter från Folke Bernadottehemet (FBH-provet) (Bille et al., 1992) and The Prudential Fitnessgram (Cooper Institute for Aerobics Research, 2001).

The test item *"climbing wall bars"* was specially designed for the TPF. Test–retest correlation of total score of the TPF is high, .90 (Fjørtoft et al., 2003). The test's construct validity was .93 for girls and .89 for boys (Spearman's correlation). According to his implicit knowledge, the validation was performed by an experienced physical education teacher who was asked to rank ten girls and ten boys in his class from lowest to highest physical fitness (Fjørtoft et al., 2003). The nine test items are:

1. Standing broad jump (StBJ) – The child starts with two feet in parallel, standing behind a starting line, one shoulder-width apart. Upon a signal, the child swings their arms backward and forwards and jumps with both feet simultaneously as far forward as possible. Test item score (best of two attempts) is the distance between starting line and landing position (in cm).
2. Jumping on two feet at a distance of 7m as fast as possible (JTF7) - Test item score (best of two attempts) is the time needed to cross the length (in seconds).
3. Jumping a distance of 7m on one foot as fast as possible - child chooses preferred foot (JOF7) - Test item score (best of two attempts) is the time needed to cross the distance (in seconds).
4. Throwing a tennis ball with one hand as far as possible - the child chooses the preferred hand (TTBH) - The child stands with the contralateral foot in front of the ipsilateral foot. Test item score (best of two attempts) is the distance thrown (in cm).
5. Pushing a medicine ball (1kg) with two hands as far as possible (PMBH) - Starting position is with feet parallel to each other, shoulder-width apart, with the ball held against the chest. Test item score (best of two attempts) is the distance achieved (in cm).
6. Climbing wall bars, crossing over two columns to the right and down the fourth column as fast as possible (CLWB) – Each column of the wall bars was 255-cm high and 75-cm wide. The test item score (best of two attempts) is the time needed for the test item (in a sec).
7. Shuttle run (10x5m) – Test item score is the time needed to run 10×5m (in a sec)—Shuttle run (10-time) with overcoming of the 5m distance.
8. Running 20m as fast as possible (R20m) - The child starts standing. With a procedural error, performance is interrupted and the test item is repeated. The test item score is the time needed to run the distance (in a sec).
9. Reduced Cooper test (MCT6) - The child runs/walks around a marked-out rectangle measuring 9×18 m (the size of a volleyball field) for 6 min. Both running and walking are allowed. The test item score is the distance covered in 6 min (in meters).

Results

Based on the above demonstrated theoretical approach, concept, and literature review of previous research findings, the main objective of actual research was to study gender, and grade-level differences in motor development, estimated through the Physical Fitness Test (PFT) results performed in school-age children (boys and girls) with intellectual disabilities. The primary objective/aim of this study was to determine and evaluate the significance of gender differences in the developmental status of physical fitness tests (PFT) within two main groups of children, intellectually disabled, in Special Elementary and Secondary schools, concerning the different age and gender characteristics of sub-samples (comparative results are presented in tables).

In the final analysis of the processed data, all other vital questions are considered carefully, if applicable, for a complete understanding of the stated research problem (Popovic, 2011).

Additionally, the special interest of this study was to determine the relationships between established level of motor abilities performance - physical fitness tests (PFT) recalculated to the Z-et score, and some specific indicators such as the participants' chronological age, educational success, and intellectual maturity within sub-samples of different ages and gender. Still, they are not presented within this study and are available in Popovic, et al., 2016; Popovic, et al., 2019a; Popovic, et al., 2019b). But in the Tables (3 and 4) are presented basic descriptive statistics parameters regarding above mentioned specific indicators. Basic descriptive parameters of the specific indicators.

Table 3
Descriptive Statistics of Special Upper Elementary School Students in Male and Female

Variables	Male (n = 51)		Female (n = 26)	
	M	*SD*	*M*	*SD*
AGEM	174.96	20.12	175.88	21.97
IQ	3.84	1.54	4.08	1,81
SCSS	3.76	.84	4.07	,93
Z - (PFT)	.08	1.98	.13	2.51

Note. AGEM = Chronological age of participants, presented in months; IQ = Intellectual maturity (1.0 - considered as moderate impairment, IQ 48 and less, 9.0 - considered as the average level of intellectual development, IQ 90 - 109); SCSS = School success, presented in decimal marks; Z = Physical fitness test (PFT) - recalculated to the Z-et score.

Table 4
Descriptive Statistics of Special Secondary school Students in Male and Female

Variables	Male (n = 38)		Female (n = 14)	
	M	*SD*	*M*	*SD*
AGEM	217.87	19.78	218.57	20.41
IQ	4.026	2.03	4.43	2.17
SCSS	3.51	.98	3.91	.83
Z - (PFT)	.27	2.46	-1.28	2.15

Note. AGEM = Chronological age of participants, presented in months; IQ = Intellectual maturity (1.0 - considered as moderate impairment, IQ 48 and less, 9.0 - considered as the average level of intellectual development, IQ 90 - 109); SCSS = School success, presented in decimal marks; Z = Physical fitness test (PFT) - recalculated to the Z-et score**.**

Central and Dispersive Parameters of the Motor Development Variables (PFT)

Table 5
Central and Dispersive Parameters and Skewness and Kurtosis Measures of (PFT) Variables for the Evaluation of Motor Development in Special Elementary and Secondary School Male Participants (N = 89)

Variables	*M*	*SD*	Min.	Max.	Variation coefficient %	Confidence interval		Skw.	Kur.	*p*
StBJ	125.00	38.51	27.0	214.0	30.81	116.89	133.11	.13	-.58	.000
2S7m	4.54	2.14	1.7	14.1	47.09	4.09	4.99	1.98	5.46	.009
1S7m	4.03	1.58	1.9	8.8	39.27	3.70	4.37	.85	.13	.087
TenB	17.50	8.90	2.7	40.0	50.86	15.63	19.38	.75	.28	.000
MedB	6.53	2.09	1.8	13.2	32.02	6.09	6.97	.37	.33	.000
Clmb	15.02	8.22	4.0	54.3	54.72	13.29	16.75	2.09	7.36	.334
10X5	27.90	4.12	20.6	43.6	14.75	27.03	28.76	1.27	2.16	.091
R20m	5.90	3.59	2.8	18.7	60.72	5.15	6.66	2.07	3.77	.000
MCT6	713.01	183.60	132.0	1182.0	25.75	674.33	751.70	-.06	.27	.000

Note. Min. = minimum; Max. = maximum; StBJ = standing broad jump; 2S7m = jumping on two feet a distance of 7m; 1S7m = jumping a distance of 7m on one foot; TenB = throwing a tennis ball with one hand; MedB = pushing a medicine ball with two hands as far as possible; Clmb = climbing wall bars, crossing over two columns to the right, and down the fourth column as fast as possible; 10X5 = shuttle run; R20m = running 20m as fast as possible; MCT6 = Reduced cooper test.
Values of Skewness and Kurtosis in intervals up -.04 to .04 are not interpreted/discussed.

Minimum and maximum values of the motor development in elementary and secondary school male participants point out that the values are placed in the inspected interval. Higher values of the variation coefficient point out in the heterogeneous male participants, according to almost all variables. The value of the variation coefficient points out the homogeneity of variable shuttle run (10X5) (14.75%). Higher values of Skewness (skw.) point out that the distribution is negative asymmetrical, which means that the curve of results distribution is inclined to higher values, respectively, and has higher values relative to the normal distribution at all variables except reduced Cooper test (MCT6) (-.06). Smaller values of the Skewness point out that the distribution is positive asymmetrical, which means that the curve of the distribution of the results is inclined to the smaller values, respectively, that have smaller values relative to the normal distribution. Higher values of the Kurtosis (kur) point out that the curve is leptosome, at 8/9 variables. The negative value of Kurtosis (kur) points out that the curve is platoic, at variable: standing broad jump (StBJ) (-.58). The values of distributions are mainly placed in the range/interval of normal distribution (p) at these variables: climbing wall bars, crossing over two columns to the right, and down the fourth column as fast as possible (Clmb) (.33). The distribution values decline from the normal distribution (p) at these variables: standing broad jump (StBJ) (.00), jumping on two feet a distance of 7m (2S7m) (.01), jumping a distance of 7m on one foot (1S7m) (.09), throwing a tennis ball with one hand (TenB) (.00), pushing a medicine ball with two hands as far as possible (MedB) (.00), shuttle run (10X5) (.09), running 20m as fast as possible (R20m) (.00), reduced Cooper test (MCT6) (.00).

Table 6
Central and Dispersive Parameters and Measures of the Skewness and Kurtosis of the Motor Development in the Elementary and Secondary School Female Participants (N = 40)

Variables	*M*	*SD*	Min.	Max.	Variation coefficient %	Confidence interval		Skw.	Kur.	*p*
StBJ	98.43	25.65	15.0	136.0	26.06	90.22	106.63	-1.01	1.98	.705
2S7m	5.17	1.67	2.9	9.6	32.29	4.64	5.70	.82	.23	.721
1S7m	4.71	2.02	2.3	13.0	42.88	4.07	5.36	2.08	5.47	.041
TenB	11.38	4.38	3.2	20.3	38.49	9.98	12.78	.46	-.57	.179
MedB	4.79	1.15	1.9	7.0	24.05	4.42	5.16	-.28	.18	.970
Clmb	21.01	10.82	7.1	60.0	51.50	17.55	24.48	1.90	4.62	.365
10X5	33.96	18.69	23.5	114.5	55.02	27.98	39.94	3.91	13.95	.000
R20m	7.26	4.14	3.5	17.5	57.03	5.93	8.59	1.42	.71	.004
MCT6	631.35	185.10	330.0	1080.0	29.32	572.14	690.56	.23	-.52	.841

Note. StBJ = standing broad jump; 2S7m = jumping on two feet a distance of 7m; 1S7m = jumping a distance of 7m on one foot; TenB = throwing a tennis ball with one hand; MedB = pushing a medicine ball with two hands as far as possible; Clmb = climbing wall bars, crossing over two columns to the right, and down the fourth column as fast as possible; 10X5 = shuttle run; R20m = running 20m as fast as possible; MCT6 = reduced cooper test.
Values of Skewness and Kurtosis in intervals up -.04 to .04 are not interpreted/discussed

Minimum and maximum values of the variables for the evaluation of the motor development in elementary and secondary female participants point out that the values are placed in an inspected interval. Higher values of the coefficient of variation point out the heterogeneous sample of the female participants in all (PFT) variables. Higher values of Skewness point out that the distribution is negative asymmetrical, which means that the curve of results distribution incline to the higher values, respectively, has higher values relative to the normal distribution, at 7/9 variables. The smaller values of the Skewness point out that the distribution is positive asymmetrical, which means that the curve results distribution incline to smaller values, respectively has smaller values relative to the normal distribution, at these variables: StBJ (-1.01), MedB (-.28). Higher (positive) values of the Kurtosis point out that the curve is leptosomic, at 7/9 (PT) variables. The smaller (negative) values of the Kurtosis (kur) point out that the curve is platoic, at these variables: throwing a tennis ball with one hand (-.57) and reduced Cooper test (-.52). The distribution of the values are mainly in the range of the normal distribution (p) at 6/9 variables. The distribution of the values declines from the normal distribution (*p*) at these variables: jumping a distance of 7m on one foot (.04), shuttle run (.00), running 20m as fast as possible (.00).

Multivariate and Discriminative Analysis Methods Application for the Estimation of the Global Gender Differences between Special Elementary and Secondary School Participants, Relative to the Motor Development

Regarding the (p = .001) value of MANOVA, and (p = .001) value of DISCRA, it is possible to conclude that significant between gender difference and the strictly defined line between the opposite sex of participants is evident. Accordingly, there is a method in use as a criterion for ranking measurement instruments regarding their discriminability. Unfortunately, particular statistical parameters are missing, so this additional analysis was not possible within this study, but for future users is provided in Table 8. However, this method was used and explained in the study dealing with the developmental characteristics of pre-school children with particular emphasis on basic motor skills and evaluation of the applied value of the used battery of tests (Popović et al., 2010).

Table 7
The Significance of the between Gender Differences in Global Sample of the Special Elementary and Secondary School Participants Relative to the Motor Development in (Physical Fitness Test) Nine (9) Variables

Analysis	*N*	*F*	*p*
MANOVA	9	3.588	.001
DISCRA	9	3.543	.001

Note. MANOVA = Multivariate analysis of variance; DISCRA = Discriminative analysis.

Table 8
The Criterion for the Ranking of Measurement Instruments Regarding their Discriminability

Points	3	2	1	0
SD and range relation	SD ~= 1/6R	1/6R ≤ SD ≤ 1/4R	1/4R ≤ SD ≤ 1/3R	1/3R ≤ SD ≤ 1/2R
Skewness	SK ≤ ±0.50	±0.50 > SK < ±1.0	±1.0 > SK < ±2.0	SK > ±2.0
Kurtosis	KU ≤ 2.75	2.75 > KU < 3.00	3.00 > KU < 4.00	KU > 4.00
Kolmogorov-Smirnov test	MaxD< 0.3	‹—	‹—	MaxD >= 0.3
Discriminativity	excellent	very good	good	poor
Limitations (D)	8 ≤ D ≤ 9	6 ≤ D ≤ 7	4 ≤ D ≤ 5	2 ≤ D ≤ 3

Discussion

In many countries of the world, experts pay great attention to the solution to questions about the health state of the population and search factors close connection with it. At the present time, we face a difficult transition period and looking for the main factors and determinants of relations between physical fitness and appropriate health state of life success in some segments of anthropological status.

How is Occupational Balance Affected by Disability?

In the language of the ICF, disability may impose both activity and participation restrictions on a child. The presence and severity of specific physical, cognitive or social difficulties may form barriers that limit a child's capacity to perform particular occupations. Comparative studies between children with and without disabilities suggest that time use for children with disability is characterized by a slower tempo, more dependence on adults, less involvement in activities outside the home or in education, and less involvement with friends (Samouilidou, 2004).

In a time-use study of 239 children with disabilities and 519 children without disabilities (aged 6-19 years), Samouilidou (2004) found that some similarities existed in activity performance with increasing age (for example, older children slept less). However, notable differences over time included more time spent watching television and only modest increases in educational activities among disabled children compared to the non-disabled control group. These findings are corroborated by more recent studies in which people with disabilities have been found to spend less time in productive occupations, dedicate more time to self-care tasks, and have more free time, which is typically less active than that of non-disabled peers (Samouilidou, 2004).

In a study of the perceptions of type of activity: resistance, aerobic and leisure versus occupational physical activity, Howley (2001) found that physical problems (pain, stiffness, and fatigue), environmental issues (for example, poor wheelchair access and the impact of climate on symptoms), overprotection and limits set by others (parents, relatives, friends, and school personnel), and self-imposed constraints, all affected participation. Author suggested that some of these constraints may have stemmed from an inaccurate understanding of the disease process, potentially leading to needless play restrictions and social isolation. To facilitate physical and mental well-being through balanced occupational involvement, occupational therapists must campaign at the individual, familial, and societal levels to improve activity participation barriers.

Physical and Motor Characteristics of Children with Intellectual Disabilities

Individuals with intellectual disabilities present a diversity of abilities and potential, so educators must be prepared to accept this diversity. However, intellectual disabilities offer a substantial disadvantage to individuals trying to function in society. They are characterized by cognitive limitations and functional limitations in such areas as daily living skills, social skills, and communication.

Children with intellectual disabilities differ least from children without 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 physiological or motor control deficits.

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).

A vital contribution to the explanation of the structure of motor abilities was given by the results of those researches in which the relation between cognitive and personality characteristics and motor abilities was investigated. To establish the way of the functioning of motor abilities, the researchers conducted the samples of the general population with different intellectual development. The study of Kukolj et al. (2002) noted that the indices that structure of motor abilities in retarded is not significantly different from those of normal.

An essential contribution to the examination of the relationship between motor and intellectual functions is the work of Ismail and Gruber (1965). The factor structure of the tests of intellectual and motor abilities was established. Except for the factor of 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 and Gruber (1967), whom the significant prediction of intelligence is possible based on the results in motor tasks, only with the tests of coordination. Balance also has a significant partial predictive validity.

Conclusion

For successful inclusion in physical activity, it is vital to find a group of people around the children that want to give it a go. But there may be some or even many obstacles, considering this situation. Some general obstacles are often reported, but they might also be some challenges specific to the actual working environment, such are: family, neighborhood, kindergarten, school, sports club, institution, etc.

Physical activity is not only provided in sports clubs that take part in organized competitions. There are also different settings: Family-oriented physical activity, Leisure time or recreational physical activity, and Regular or adapted sports clubs.

A method introduced by the National Indications to produce documents for the teaching and training process is the pupil's portfolio. In particular, they are the documents concerning the competencies reached by the pupil starting from childhood. For example, a database about a pupil on movement experiences shows processes and products, the needs and the movement attitudes expressed by everyone in personal training item, the proposed initiatives, time and ways for the realization, the proposed motivations, the answers received for a new assessment, at the same time and in the following phase. People should consider taking advantage of the necessary knowledge, suggestions from someone who might have more experience in this area, and strategic measures required to make things happen (referring to laws and regulations, economy, positions within the governing bodies, etc.)

Involved individuals should be informed of the fact that there is no perfect or complete method. Every child is unique, and so they should be. The inclusion process is a permanent process on which the persons involved have to work and redirect continuously. The process is an inevitable part of the work towards the fulfillment of a common goal. An evaluating way of the movement competence is the collection of the activities put into practice, starting from precise aims and criteria, of the experiences done by the pupil during a specific training practice, named the assortment of movement competencies. This set represents the documents of various performances to analyze specifically effort and beyond, interpret and evaluate to certify the level of competencies reached. The physical space should be barrier-free and include various equipment related to the activity. The social-emotional atmosphere should be free of stress, emphasizing cooperation rather than survival of the fittest, fastest, or strongest. Teaching strategies should incorporate techniques that promote collaboration between instructor and learners, respond to different learning styles, encourage self-responsibility, provide opportunities for independent learning, and use various informal assessment tools to guide instruction.

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