

An Overview of Physical Development

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If the youth of today are to be educated from a more holistic perspective, it is imperative that a concerted effort be made to teach the importance of the physical domain. This paper provides an overview of the importance of maintaining physical fitness and proper nutrition as well as an overview of the means by which this physical fitness can be obtained and maintained. Cardiovascular endurance, muscular strength, muscular endurance, flexibility, and body composition are components of physical fitness; consuming a healthy diet that includes grains, fruits and vegetables, and lean protein sources are aspects of good nutrition. The paper also reviews literature related to the assessment of components of physical fitness.

The education of children and youth today encompasses much more than the traditional reading, writing, and mathematics seen in years past. According to Huitt (2004), there is a need to consider the education of our young people from a more holistic perspective. This paper will address the importance of considering the physical development of children and youth.

Booth, Chakravarthy & Spangenburg (2002) propose that the human body is genetically prepared for a higher level of physical activity than is current among most people in post-industrial societies and that physical functioning of the body influences all other domains of the individual. This relationship is best described through the concept of wellness, referring to the total health of the individual including the mental, physical, emotional and spiritual domains (Edlin, Galanty & Brown, 2002). From the perspective of wellness, each aspect of one's health must be viewed with equal importance because they are all intertwined. If one area of health is neglected, other domains suffer as well.

At the same time that there is a concerted effort to raise test scores (Rebora, 2004), there is a steady decline in the overall physical health of our nation (U.S. Department of Health and Human Services, 2001). Two diseases in particular are increasing in epidemic proportions: obesity and Type 2 diabetes. This rise is linked with two major factors: physical inactivity and poor nutritional habits.

The Surgeon General reported that nearly 50 million adults between the ages of 20 and 74 are obese. Overall, more than 108 million adults are either obese or overweight. That is an astounding 61% of the U.S. population. Though previously considered an adult disease, Type 2 diabetes has increased dramatically in children and adolescents. Laino (2003) reported that one in three American children born in the year 2000 will develop diabetes if they adopt the nation's inactive and overeating lifestyle.

One way to address these issues and curb these trends is to better educate our children and youth about the importance of regular physical activity and proper nutrition. Exposure to these topics beginning in early childhood is crucial to the healthy development of our youth. Throughout the remainder of this paper, more specific issues regarding physical development will be explored, suggestions will be made as to what parents and educators can do to help promote physical development, and measurement issues will be considered that can help the educators, parents, and the community take more responsibility for the health of our nation.

Fitness Component

When discussing the physical domain of the human body, it is important to consider five health-related fitness components: cardiovascular endurance, muscular strength, muscular endurance, flexibility, and body composition.

Cardiovascular endurance is defined as the ability of the lungs, heart, and blood vessels to deliver adequate amounts of oxygen and nutrients to the cells to meet the demands of prolonged physical activity. The American Heart Association (2004b) reported that cardiovascular disease is the number one killer in America. Therefore, activities promoting cardiovascular fitness are extremely important in the prevention of this life threatening disease as well as other degenerative illnesses that can be related to poor cardiovascular endurance.

The second and third components of health related fitness are muscular strength and muscular endurance. Muscular strength is the ability of the muscle to exert a single maximum contraction, where as muscular endurance is the ability of the muscle to work for long periods of time without getting tired. Muscular strength and endurance are extremely important for everyday living. Daily activities such as climbing stairs, carrying groceries, as well manual labor, require both strength and endurance of the muscles.

Although it is often times overlooked, flexibility is yet another key component to health related fitness. Flexibility is defined as the joints ability to move through a full range of motion. Excellent flexibility provides various health related benefits, which include improved physical performance, greater freedom of movement, improved posture, an increase in physical and mental relaxation, and a decrease in the risk of injury. Although an individual's level of flexibility is primarily due to genetics, gender, and age, it is important to recognize that the level of physical activity plays an important role as well. In simple terms, the less physically active we are, the less flexible we are likely to be.

Probably the most outwardly visible sign of an individual's level of physical activity is body structure or body composition. Body composition is the percentage of fat and muscle that makes up a person's body (Rimmer, 1994). For good health, an individual should maintain a proper ratio of one to the other. When levels of body fat are high, an individual is at greater risk for a variety of health problems. High percentages of body fat are strongly correlated with arthritis, heart disease, hypertension, and diabetes. There are many different ways to find body composition; however, not all are accurate. Height and weight charts are probably one of the least accurate means of finding body composition. An individual's muscle mass is not taken into consideration; therefore, someone may be considered obese when in reality they have a large amount of lean muscle in the body. Body mass index (BMI), another commonly used measure of body composition, assesses one's body weight relative to height. A person with a BMI under 18.5 is considered underweight. BMI values of 18.5-25.9 is considered normal, 25-29.5 is considered overweight, and 30 or over is considered obese. The National Center for Chronic Disease Prevention and Health Promotion (2004) provides a easy-to-use, web-based process for calculating BMI.

Understanding the importance of body composition is essential when considering issues regarding overall health. In most schools, when fitness testing is administered, the body composition component of the test is removed because it is considered embarrassing to the child if the percentage of body fat is too high. However, as educators, it is necessary to provide this information to the student and parents, taking the same care with physical data as with academic

achievement data. Dealing with the issue while the student is still in school could actually save the individual's life later.

Influencing Factors

There are two major factors that influence each of the health related fitness components: physical activity and nutrition. Education in both areas is critical in helping an individual to develop overall physical health.

The benefits of physical activity have been viewed as important in our society for many years. However, it was not until the second half of this past century that evidence from a scientific standpoint began to support these beliefs (Cooper, 1991, 1999). There is an accumulating body of evidence to support the fact that young children are becoming less physically active and more overweight and obese. For example, the Centers for Disease Control (CDC; 2000) reported that physical inactivity has contributed to the 100% increase in the prevalence of childhood obesity in the United States since 1980. In addition to issues regarding obesity, many studies on physical activity have shown that the body responds to exercise in ways that have positive effects on the cardiovascular, respiratory, endocrine, and musculoskeletal systems. More specifically, physical benefits of exercise such as increased muscle strength, range of motion, flexibility, posture, and endurance, all promote self-sufficiency and decrease feelings of depression, dependence, and lack of control. Regular participation in physical activity also appears to reduce anxiety, improve mood, and enhance an individual's ability to perform daily tasks. Also, emerging research in animals and humans alike suggests that physical exercise may boost brain function, improve mood, and otherwise increase the capacity for learning (Kong, 1999).

Proper nutrition is the other major factor that influences physical development. Many adults have been taught incorrect information about nutrition and are teaching this to their children (Willett, Skerrett, & Giovannucci, 2001). For the well being of our children, adults need to become more aware of what proper nutrition encompasses and attempt to instill proper nutritional habits in children from an early age. Unfortunately, some of the information coming from respected sources is inaccurate (Willett, 2001). For example, the Dietary Guidelines for Americans published by the United States Department of Agriculture (1995) suggests that the daily diet should contain 6 to 11 servings of foods high in carbohydrates such as bread, cereal, rice, and pasta. However, the suggestions from faculty at the Harvard School of Public Health (Willett, et al.) propose these foods should be used sparingly. While both suggest eating healthy foods such as grain products, fruits and vegetables, low-fat dairy products, beans, lean meat, poultry, fish, or nuts, the recommended portions of each are often quite different (see Willett, 2001 for a detailed comparison).

It is also important that adults teach children healthy eating by example. Children should not only hear educators and other adults telling them how they should eat, but they should also see those around them eating these same healthy foods. There is a caveat in the recommendations from experts: dietary guidelines are intended for children over the age of two years. Infants from birth to the age of two need a higher amount of fat intake in their diet because of their rapid growth rate. The American Heart Association (2004) states that beginning around the age of two, toddlers can be moved on to the recommended dietary guidelines recommended for adults. Parents should consult their family pediatrician for more specific dietary guidelines for an infant.

Staying up-to-date on current information regarding nutrition and following recommended dietary guidelines are important factors in being able to help properly educate our youth.

Educational Programs

There needs to be a concerted national effort to curb the current trends of cardiovascular disease, obesity, Type 2 diabetes, and other degenerative illnesses related to physical inactivity and improper nutrition. In order to take a step in the right direction, the first priority must become stressing a greater importance in the area of physical development in our educational system. One of the most distressing statistics of all in the relationship of disease and physical inactivity are the statistics that show physical education programs throughout our nation are being placed on the back burner. The CDC (2000) reported that nearly half of young people 12-21 years of age are not vigorously active. For most children, physical education class is the only place they will have any type of exposure to physical activity. Yet, only one state, Illinois, requires daily physical education in all grades K-12. In Georgia, only one semester of health and physical education combined in high school is required for graduation. If this is the case, what can educators and parents do to help children and youth in the area of physical development?

Physical Education Programs

From an educational standpoint, it is imperative that standards be established that will guide the physical development of children and youth throughout their years of formal schooling. Effective physical education programs should set clear expectations of students, specifically designed as age appropriate. Expectations should not only cover the development of motor skills, they should include aspects of the cognitive and affective domains as well. Those in charge of setting standards, such as those implemented in South Carolina (South Carolina Department of Education, 2004), should be applauded for showing a commitment to the overall health of their children.

In South Carolina, seven different standards must be met if an individual is to be considered physically educated. All standards are addressed at each grade level, though each is modified so that it is age appropriate. In addition, all standards at each grade level are given an example of assessment that are used to monitor student learning and development. For example, physical education standard number one states that students should be able to demonstrate competency in many movement forms and proficiency in a few movement forms. The standard is then modified for age appropriateness so that, in preschool and kindergarten, the standard specifies that students should be able to display most fundamental movement patterns (e.g., throwing, receiving, jumping, and striking) in simple conditions and demonstrate control of the varied use of these patterns.

Each standard includes several benchmarks so that student learning can be monitored. An example of a benchmark for preschool and kindergarten is: the student will travel with control forward, backward, and sideways using a variety of locomotor patterns and change directions quickly. In addition to the benchmarks, an example of assessment is given which includes teacher observation along with criteria for assessment of the movement patterns. If the task is to demonstrate a locomotor skill (e.g., slide, hop, skip, or gallop), the teacher assesses the task and three points are given if the student demonstrates each pattern at a level of mature form. If the student demonstrates the beginnings of each pattern but it is not fully developed, two points are

given. Finally, one point is given if there is no evidence that the student can demonstrate the pattern at the time. This is just one example of the format used for students in the state at each grade level. The South Carolina Department of Education (2004) website provides further information regarding effective physical education programs and a complete list of state standards. It is of utmost importance that all educational systems adopt these kinds of standards and make a more concerted effort to hold educators accountable for teaching and measuring them. These issues will be addressed later in the paper.

Age-appropriate Activities

As educators and parents consider how to help children develop the five health-related fitness components it is important to consider the age-appropriateness of activities. Obviously, one would not expect a young child in the first or second grade to participate in the same type of muscular strength and endurance training as a senior in high school. It is necessary to develop exercise prescriptions for both the elementary, middle grades, and secondary levels. The goal of the prescriptions is to increase the activity level of all students to at least 60 minutes per day by suggesting activities which students can engage in outside of the classroom. Within this prescription, detailed instructions must be given for activities that are age appropriate for the development of each health-related fitness component; students can chart the time spent engaged in the various activities for their math classes and write about their exercise in their language arts classes. It is important to consider that fitness activities need to be made fun for children or they will not want to participate. For most individuals, giving a direct command to go out and run two laps will not be an interesting activity in which to participate.

In the area of cardiovascular endurance some fun activities for elementary age and middle school students might include: flag tag, a 15-minute fun circuit, or a family fun walk. In a game of flag tag, each student puts a flag in their back pocket. On the signal the students begin chasing others around the designated area, attempting to grab as many flags as they can. At the end of 1 minute, stop the game; the person with the most scarves is declared the winner for that round. The 15-minute fun circuit includes stations for jump rope, jumping over a hoop, jumping jacks, and mountain climbers. Adding music to the fun circuit makes the activity even more appealing. The family fun walk is an activity that can take place at home. With the family, students are encouraged to take a brisk 20- minute walk throughout the neighborhood. A list of items to be found along the walk can be compiled to make the walk into a scavenger hunt type of activity.

For middle grade or secondary age students, flag tag can be modified into rollerblade flag tag. The same directions would apply with the exception that the students are rollerblading instead of jogging. Jumping rope is another cardiovascular activity that older students can enjoy. Creating task cards and routines as well as setting the activity to music is an excellent way to engage students in a cardiovascular workout. It is also important to consider that basic activities such as jogging, walking, swimming, and aerobic dance are also considered excellent activities for people of all ages that promote cardiovascular endurance.

When most people think of muscular strength and endurance training, they immediately think of weight training in the weight room. However, educators should be aware that weight training is not a feasible activity for younger children. There are many activities that students of all ages can engage in without ever entering a weight room facility. For elementary age children, activities like tug-of-war, push-up routines, and the use of a stability ball can all assist in the

development of muscular strength and endurance. Middle school and secondary level students can also use the stability balls, yet they may also safely begin workouts within the weight room environment. It is crucial for educators and parents to understand that teaching proper technique as well as having proper supervision are key elements in a successful weight lifting program.

Body composition can be developed through a variety of activities. The stability ball can be used to perform sit-ups and crunches for students of all age levels. Each activity can be modified to fit the ability level of all students. For example, level one would consist of sitting on top of the ball, lying back and performing a certain number of sit-ups. In level two, there is a slight increase in the difficulty of the task. At this level, the student slides down the ball with their back at a slight angle. The student then attempts to perform the set number of sit-ups. Level three would be the most difficult. The student would lie down with their back on the ground, and their legs on top of the ball while performing the sit-ups. Older students can also use weight training as a method of developing body composition. Educators and parents need to also consider the importance of proper diet along with these methods of exercise when attempting to develop body composition.

The development of flexibility is mainly acquired through stretching programs. Stretches can be categorized on a continuum from static (no motion) to ballistic (rapid motion) (Kurz, 1994). Static stretching involves stretching a muscle to the farthest point and holding the stretch. Isometric stretching is a type of static stretching which involves resistance of muscle groups through the tensing of the muscles. This type of stretching is considered one of the best ways to increase flexibility. Passive stretching is sometimes referred to as relaxed stretching. During a passive stretch, an individual would assume a position and hold it using another part of the body, a partner, or an apparatus of some type. This type of stretching is good for cooling down after a workout because it helps to reduce muscle fatigue and soreness. Active stretching includes assuming a position and holding it there with no assistance other than using the strength of your agonist muscles. Active stretches are usually very difficult to hold for more than ten seconds and should not be held anymore than fifteen seconds. One would find this type of stretching in an activity such as yoga. Dynamic stretching involves moving parts of one's body and gradually increasing reach, speed of movement, or both. Dynamic stretching can be useful as part of a warm-up for an aerobic workout. Ballistic stretching uses the momentum of a moving body part or limb in an attempt to force it beyond its normal range of motion. This type of stretching is not considered useful and it has also been known to lead to injury.

As mentioned earlier, any physical activity designed for young children needs to be made fun. Although stretching routines can be very monotonous, they can be made more exciting for young children by simply adding music and giving each stretch a unique name.

Classroom-based Activities

Although the physical education classroom is a critical area for the development of the physical domain, the push for more physically active students should not end there. Educators need to be aware that young children learn about the world through movement and physical activity. Classroom teachers should keep in mind that physical activity can be integrated within other subject areas to give children opportunities for more movement throughout the day.

One way to incorporate this physical activity would be to use a thematic approach to teaching units within the curriculum. An example of a thematic approach would be an Olympic Games theme. In the area of Language Arts, students can read books, write reports, and perform

skits that pertain to the games and athletes of the Olympics. Students can be shown maps in Social Studies, where they can compare the geographical locations of where they live and the place where the games are being held. A scale could be made up that shows the number of steps taken that are equal to a certain number of miles. Students could be given pedometers to calculate how many steps they have taken since the last class period. Each day when the students enter the classroom, they would go to the map and chart their “distance traveled” toward the sight of the Olympic Games. In math class, students can be introduced to the use of stopwatches. Teachers can have the students’ time each other in a few physical skills and the data collected can be analyzed and graphs can be made using the results. Finally, in physical education classes, students could participate in activities similar to those of the Olympic Games. Through the use of this theme, each subject area teacher will have then done a small part in incorporating some type of physical activity into their classroom.

Parent Involvement

In addition to introducing children to physical activity through physical education programs and integrated curriculum parents can be encouraged to become involved in this aspect of their children’s development. Children today are leading a more sedentary lifestyle than ever before (U.S. Department of Health and Human Services, 2001). The days of coming home from school and playing outside until dark have been replaced with activities such as watching television, surfing the internet, and playing video games. However, there are many things that parents can do to get children out of the house and involved in some type of physical activity (New York Online Access to Health, 2004). Some of these activities may include taking family walks or bike rides, going to the park or other recreational facilities, encouraging participation in extracurricular activities, and encouraging playtime outdoors. Parents should also get involved in school activities. They can ask their children what they are doing in physical education or better yet, visit them in class. Encouraging them to practice skills learned or practicing with them can be an effective way to keep them turned on to physical activity.

Measurement and Evaluation

The final issue that must be addressed is how appropriate development of children and youth in the physical domain can be addressed. It is our belief that the answer is simple. Fitness testing within the educational system must be required and educators must be held accountable if standards are not met. Testing is required in all other areas of education and physical development should not be held to any lower standards.

There are three different programs that provide excellent examples of effective tools for measurement within physical education: FITNESSGRAM, Physical Best, and the President’s Challenge Physical Activity and Fitness Awards Program. FITNESSGRAM is a health related physical fitness assessment that was developed in 1982 (The Cooper Institute, 2001). The goal of this program is to develop an easy way for physical educators to report the results of physical fitness assessments to parents. Each student is assessed in three areas of health-related fitness: aerobic capacity, body composition, and muscular strength, endurance, and flexibility. Activities within the category of aerobic capacity include The Pacer (a 20 meter progressive, multi-stage shuttle run set to music), a one mile walk/run, or a walk test which is commonly used for secondary students. In the area of body composition, percent body fat can be calculated by taking

skin fold measures from the triceps and calf or through Body Mass Index which is calculated from height and weight. Muscular strength, endurance, and flexibility can be measured in one of several ways. Abdominal strength is evaluated through a curl-up test. Trunk extensor strength and flexibility is evaluated by means of the trunk lift. Upper body strength can be measured by either the 90 degree push-up, the pull-up, flexed arm hang, or modified pull-up. Finally, flexibility can be measured by the sit-and-reach test. When testing is complete, students are compared on an individual basis to health related fitness standards that were carefully established for age appropriateness and gender. Each student tested receives a report which contains objective, personalized feedback and positive reinforcement. This is critical in changing behavior patterns and it also serves the purpose of essential communication between educators and parents. In order to obtain the maximum benefit of the fitness test, a pre-test and post-test should both be administered. This is the only way to tell if progress has been achieved throughout the student's time in physical education.

Physical Best is considered to be a companion product of FITNESSGRAM (American Fitness Alliance, 2001). It is considered to be a complete educational program for teaching all areas of health related fitness. It was developed by the American Alliance for Health, Physical Education, Recreation, and Dance (AAHPERD) and it includes learning activities for aerobic capacity, muscular strength, endurance, and flexibility, and body composition. The Physical Best program contains materials, books, computer software, as well as hands on training through workshops that attempt to assist physical educators in impacting the long-term health of their students.

The final program to be considered is The President's Challenge Physical Activity and Fitness Awards program (see <http://www.presidentschallenge.org/>). What began as a simple physical fitness test has expanded its Presidential Active Lifestyles Award (PALA; see http://www.presidentschallenge.org/earn_awards/awards_available.aspx). PALA recognizes children between the ages of six and eighteen for being physically active at least sixty minutes a day for five days a week. This must last for a period of at least six weeks. However, the recognition does not stop with that age group. Realizing the importance for lifetime physical activity, they also recognize adults and senior citizens that remain active at least thirty minutes a day for five days a week during a six week period.

Summary and Conclusions

With the health of our nation in its present state, those who are concerned about the development of children and youth can no longer keep the focus of overall education solely on increased scores on standardized tests of basic skills. The importance of physical activity and proper nutrition must be emphasized as well. From an educational standpoint, our nation can no longer afford to consider physical education merely a place for athletes to excel. Educators in every aspect of our schools must make a more concerted effort to focus on the physical development of each and every student irrespective of one's discipline. If the present disturbing trends continue, our system may continue to turn out intelligent and competent workers; however the life spans of these individuals will not steadily decrease. As you think about the issues proposed in this paper, ponder over this one last thought: how effective is the most intelligent and successful person in the world, if that person dies at an early age or has his or her productivity cut short because of debilitating disease. It is our hope is that through the information presented in this paper, educators and parents alike will begin to take notice of the

importance of the physical development of children and youth and will begin to advocate a focus on this domain in schools as well as the home and community.

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An Overview of Query Optimization in Relational Systems. Surajit Chaudhuri. Microsoft Research One Microsoft Way Redmond, WA 98052 +1-(425)-703-1938. The query execution engine implements a set of physical operators, An operator takes as input one or more data streams and produces an output data stream. Examples of physical operators are (external) sort, sequential scan, index scan, nested-loop join, and sort-merge join. I refer to such operators as physical operators since they are not necessarily tied one-to-one with relational operators. The simplest way to think of physical operators is as pieces of code that are used as building blocks to make possible the execution of SQL queries. This study synthesized literature concerning casual evidence of effects of various physical activity programs on motor skills and cognitive development in typically developed preschool children. Methods . Electronic databases were searched through July 2017. Of the 10 studies assessing the effects of physical activity on motor skills, eight (80%) reported significant improvements in motor performance and one observed mixed findings, but one failed to promote any beneficial outcomes. Of the five studies investigating the influence of physical activity on cognitive development, four (80%) showed significant and positive changes in language learning, academic achievement, attention, and working memory. Physical growth and development in childhood influence several measures of social performance such as longevity, capacity for work, productivity and skills of the labor force. Research continues to elucidate these relationships and the understanding of some connections, such as nutrition and personality, are very preliminary. 9.3.1 Wages, Cognition and Labor Productivity. Abnormalities of physical growth and development may complicate chronic arthritis. Linear growth is retarded during periods of active systemic disease. 303 With better disease control, attainable through the use of methotrexate and the biologicals, severe growth retardation is increasingly uncommon.