

Introduction to the Study of Children's Physical Education in the 21st. Century

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1. Introduction

The modernization of our lives has been greatly accelerated by urban migration. At the same time, family life and the living environment of our local communities have been changed by the aggregation of farms and houses causing traffic jams, noise, and air pollution. For twenty years there has been a shortage of playgrounds for children and the remarkable deterioration of environments conducive to healthy and active daily living has become a serious social problem²³⁾. This situation is also true in other countries⁴⁾⁵⁾¹²⁾¹⁸⁾²¹⁾.

In Japan, it is quite difficult for children to develop their physical strength and motor skills properly in an environment where most children go to cram schools, the favorite activity is playing video games, and there are few games involving active physical exercise. Thus, it should be our duty to develop new strategies for the proper physical development of children so that they can enjoy healthy lives in the 21st century despite the degradation of the social environment and the circumstances in which children live.

This paper discusses children's physical training programs for the 21st century based on an analysis of physical and environmental changes over the past 20 years. The importance of exercise in childhood from nutritional, biological, physiological, psychological and kinesiological perspectives is also discussed.

2. Problems and tendencies of physical changes in children

Education policies have tended to view the development of mental, intellectual and physical abilities—especially in infants—from the perspective of developmental psychology. Though this may be important for the formation of character, it causes problems in the physical development of children, since there is an increasing incidence of adult

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diseases in children such as diabetes and atherosclerosis which were previously seen in adults only.

The human body maintains its activity using blood glucose as an energy source. Thus, increase or decrease in blood glucose significantly influences the human body. Humans ingest food through the mouth. Then the food is digested in the stomach and bowel, and nutrients are absorbed into the blood with the help of various hormones. Blood glucose is utilized in various physical activities. If ingestion and utilization are in balance, a healthy life is maintained. Since the proportion of children's physical activity to food ingested has decreased, excess amounts of blood glucose are converted to cholesterol and fat, and accumulated on the blood vessel wall and subcutaneous tissue, which is the main cause of adult diseases in children.

This may be due to the change in diet caused by higher standards of living, and environmental change. The games children prefer have changed from active games using the whole body (whole body activities) to less active games using only a part of the body such as video games or playing with sand (partial activities). Furthermore, children can eat any food or sweets whenever they want in this so-called satiation era. These might also be factors in the increasing incidence of adult disease in children. This is a serious social problem.

Ichikawa⁸⁾ investigated the daily activities of 15 children in a kindergarten using a pedometer. The lowest pedometer count was 4,500 and the highest was 10,350. This means that even during approximately 5 hours of kindergarten activities, there were significant differences among children. If these tendencies are prolonged, children with lower activity levels may develop a high risk of adult disease.

According to an article in the Shinano Mainichi News entitled "Sports and Health", the mean blood cholesterol level of Japanese children was among the five highest in the world in 1990. This means that Japanese children have a high risk of arteriosclerosis. Six out of every ten children in Japan have high total blood cholesterol levels. This percentage was greater than that for American children. The mean cholesterol level in primary school children and junior high school students in Japan has been increasing by one mg per year for the past 10 years. Also there was an article in Life Family reporting that one in every 5 children needs medical treatment or counseling for daily living according to a health survey of primary school, junior high school, and high school students conducted by Tokyo Metropolitan Government in 1993. According to School Health Statistics published by the Ministry of Education, the tendency toward

obesity in children was first evident during the 1970's, and the proportion of obese children in each class has increased two- to three-fold during the past 20 years. The incidence of various diseases that were considered specific to adults has been increasing steadily among children. This tendency is also true in other countries¹⁾¹¹⁾¹⁷⁾¹⁹⁾.

When viewing these physical changes in children from a social perspective over the past 5 years, many hospitals and health care centers evaluated the obesity and cholesterol levels of children in 1990 and warned of the significant increase in the number of fat children. To cope with this situation, exercise and nutritional education were proposed. Around 1992, various alimentary therapies were carried out with no significant effect. From the latter half of 1993, the emphasis has been changed to exercise such as camping and exercise counseling. According to the Shinano Mainichi News in 1995, the proportion of fat children was 7.6% in urban areas and 11.2% in rural areas, showing that the situation has now reversed from the previous findings.

Therefore, it is only a myth that children autonomously exercise as needed, and children in rural areas have less risk of obesity than those in urban areas because of environmental conditions. We should face the situation described above and take measures to cope with it. If we do not address the situation, the risk of adult diseases will become more serious.

3. Necessity of physical exercise in children

1) Developments in higher animals

Children need physical activity because human babies are born in an immature state compared to other higher animals. This theory of the "physiological immature birth of man" was advocated by Portmann¹⁶⁾, a German biologist. He pointed out that newborn babies of other higher animals such as gorilla, monkey, horse and cow can walk immediately after delivery, whereas a human baby requires approximately one year to start walking. He claimed that although the development of the nervous system, visceral, and muscular function is almost completed during the fetal stage in higher animals other than humans, 10 months of fetal development are required for the human brain, but human babies are delivered with immature physical systems. Therefore, physical exercise is necessary to acquire basic living skills. From this perspective, active physical exercise performed by an infant can be considered instinctive behavior to gain physical strength and balance the development between brain and body. However, this instinct in children has changed significantly because of changes in the social environment.

2) Infant motor function

The development of human motor function is not completed during the fetal stage. After delivery, motor function is acquired in progressive stages. Humans grow until approximately 20 years old. However, development of the nervous system, muscular function and visceral function do not keep pace with each other. Especially, significant development takes place in the nervous system from 7 months, and synapse formation is almost complete by 10 years. Subsequently, energetic build up of physical strength including strong muscle and cardiothoracic function takes place from 10 to 20 years old. Thus, the timeliness of various exercises in accordance with human developmental stages is very important.

Next we will focus on the mechanisms for acquiring motor function in each developmental stage. A newborn baby only reacts to external stimuli. There are 4 kinds of reflex movements: (1) sucking reflex; (2) grasping reflex; (3) Babinski toe reflex; and (4) Moro reflex. These reflexes, not governed by the cerebrum, are essential to survival. Especially, if a baby has no sucking reflex, he cannot drink milk and will die. In normal development, voluntary movements take over these reflex movements after 7 months of age. These centrally controlled voluntary movements are very important in acquiring motor abilities. Motor activities are performed by muscle systems innervated by the central nervous system. Synapse formation within the central nervous system is the key to motor ability. This synapse formation is almost completed by 10 years.

Thus, a person with quick movements might have preferred whole body exercise during childhood from 6 months to 10 years old; including climbing frames, horizontal bar, ball games, and tag. Whereas, a person with slow movements might have preferred partial activities during this period; such as playing with sand, drawing, and reading books.

3) Hierarchy of motor function

Before 7 months of age, a baby acts only by reflex, for example the grabbing reflex. Then, he acquires voluntary movement governed by the brain, and basic movements of arm extension, grabbing, and release emerge. Subsequently, coordinated movements based on two or more different motor components such as grabbing and throwing are created. And, skilled movements such as the jumping throw of a baseball player emerge in the final stage of development. Thus, we have the sequential stages of motor function: reflex movement, basic movement, coordinated movement, and skilled movement²⁾. Of these, reflex movement and basic movement are acquired naturally

during developmental stages, whereas coordinated movement is acquired only by training since this movement requires coordination of two or more motor components. Such coordinated movements are most efficiently acquired from 4 to 7 years. By repeating different motor components, synapse formation is facilitated, thus connections between two or more motor units become tight, and the child develops quick movements.

4. Problems in athletic training in infant education

Despite the importance of creating basic neural control systems for future life, whole body activities are not actively performed at infant education facilities. This tendency may be due to the fact that infant education is mainly based on psychological theories. Especially, in developmental psychology, the concept that "children develop themselves by interacting with their environment, and internalizing their experiences" is the basic theory. From this perspective, sports training and physical training are not necessary even though they appear so for adults²⁰⁾. Furthermore, training is mainly carried out by instructions, which is thought to be influential in forming character. This is because, in children, perception of ability is thought to be a main factor of self-perception, and to create perception of ability without inseminating perception of inability, a child should determine his actions by himself, not by instruction or command.

This is one of the basic theories of infant education and is very important. However, this is not so very different from the educational theory of 20 years ago. Since being applied to theories of physical education, nonintervention in children's physical activities has become the mainstream of athletic training. However we should consider the fact that this educational method has encouraged many children to dislike physical exercise.

Hurlock⁷⁾, a psychologist, claimed that motor clumsiness is caused by stiff cooperative movement in children for their age and retardation of motor skill, and subsequently results in psychic trauma such as inferiority complex, lack of confidence, and dependency. In such situations, negative self-perception is created by motor clumsiness and leads to passive and dependent personalities. This is the opposite of the goal of infant education.

Therefore, we can conclude that healthy mental development can be facilitated if motor skills develop to some degree. We should reconsider current tendencies in infant education, that is, nonintervention in children's physical activities³⁾⁶⁾¹⁰⁾¹³⁾¹⁴⁾¹⁵⁾. The social environment changes year by year. The notion that disliking physical activities

indicates no sense of motor skills, is a notion of the past. Currently, poor physical activities lead to a fat child with a high risk of adult disease. Thus, disliking physical activities is a life-threatening problem. We should develop measures to cope with the situation when we develop new athletic training programs.

5. Future athletic training programs

1) Cause of increasing numbers of children who dislike physical exercise

Rope skipping stimulates the nervous system and promotes motor skill. Most children play this game. However, it is very difficult to make all children perform this exercise. This exercise can be divided into 4 motor components²²⁾: (1) to properly arrange both legs; (2) to jump vertically with both legs; (3) to jump in a proper time sequence synchronized with the rotation of the rope; and (4) to move both arms rhythmically. Children can perform rope skipping well only when these four components are integrated. However, when we observe an actual training situation, children try rope skipping even if they cannot perform vertical jumping with both legs (1, 2). This is as if children who do not know algebra try to determine factors in an equation. The most important step is to be able to perform vertical jumping with both legs well. Then, synchronization with the movement of the rope and rotation of the arms should be learned. Children of earlier historical periods acquired jumping with both legs naturally through various games such as hopscotch, rubber jumping, and ken-pa play. So instructions in steps 3 and 4 were sufficient for rope skipping training. However, today's children have no experience with such games, and they cannot perform rope skipping well.

In the past, almost all basic movements were acquired through various games, and motor exercises could be performed well with a little practice. On the contrary, today's children are not equipped with such basic movements. If children try to perform such physical exercises, they are not able to perform well, which creates negative self-perceptions leading to shyness and miserable feelings⁹⁾ which is the main cause of disliking physical exercise.

2) Suggestions for encouraging children to perform active physical exercise

Though we all know the importance of whole body exercise during childhood, we do not have sufficient playgrounds for children to perform whole body exercise. In child education, the psychological consideration is dominant, and physiological and kinesiological findings are less accepted. If we extrapolate this tendency, approximately a half of our children will be fat children with a high risk of adult diseases in the 21st century.

We would like to suggest encouraging children to perform motor exercise more rigorously. Using a questionnaire on likes/dislikes in physical activities, we surveyed 300 university students (mean age 20 years) in 1991. Thirty percent of the respondents answered that they like to perform exercise, 40% answered that they don't like physical exercise, and 30% answered that it was hard to say which. To subjects who answered 'like' or 'dislike' to motor exercise (70%), we asked further when they developed this feeling of like/dislike. Eighty percent of them answered that it was the early pre-school to early primary school period. Most students who liked to exercise were stimulated by the experience that they could perform difficult exercise programs well, and friends and teachers praised their performance. However, most students who disliked exercise often recalled being unable to perform the exercise program that other children could do, and even when they made an effort, nobody encouraged their endeavor. From these results, we suggest that we should carefully select exercise programs for children so that every child can perform the program well. These exercise programs should include personal programs in which everybody can evaluate performance, such as horizontal bar, rope skipping, and vaulting-horse. Through these exercise programs, every child would experience successful performance, and develop confidence in their motor abilities. This would be the only way to encourage children to perform physical exercise actively in the current social environment.

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