

Actual Conditions and Prevention of Musculoskeletal Dysfunction in Japanese Children from the Orthopedic Viewpoint: An attempt in Kyoto Prefecture, Japan

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Musculoskeletal Dysfunction

The term *musculoskeletal dysfunction* is a condition when one feels that “my joint doesn’t work as much” or “my muscles are going weak,” which is defined as *a condition with functional disability of the musculoskeletal system*. Recently in Japan, the issue of *musculoskeletal dysfunction in middle-aged and elderly populations* is attracting social attention because it is deeply associated with the problems among elderly such as being bedridden and the needs of nursing care.

The *musculoskeletal dysfunction in children* is also very important. There are various causes, which can be grouped into three types: 1) lack of physical exercise, 2) excessive physical exercise, and 3) other musculoskeletal diseases (congenital, acquired, or traumatic). This report will focus on the *musculoskeletal dysfunction due to lack of physical exercise* among children in Japan.

The Need for Musculoskeletal Examinations at Schools in Japan

We consider that musculoskeletal examinations are necessary at schools for the two reasons. First, children nowadays can be separated into two extreme groups: too-much-physical-exercise group and too-little-physical-exercise group. In either case, children are facing certain health problems. Secondly, even if a child has a musculoskeletal injury or disease, it is not always detected or real-



ized at an early stage. We very much hope to improve it and make early detection possible.

One example of the latter is abnormality of the humeral capitellum, a type of “baseball elbow,” which occurs very commonly in children during the growth period. If left untreated, it worsens steadily from an early to progressive stage and then progresses to terminal stage. In an early stage, it is possible to make full recovery in many cases. However, had it progressed to a terminal stage, the prognosis would be tragic. It may result in serious late effects that not only affect the patient’s ability to play sports but can also interfere with daily life. According to the study by Matsuura et al.,¹ 94.9% of the cases detected during an examination held at a baseball stadium on the day of a game were in an early stage. However, 43.7% of the children who

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visited sports medicine clinics were already in a terminal stage.

This problem of “baseball elbow” is just one example. We should not allow children to be injured and left untreated while they do not know what is happening. I strongly suggest conducting musculoskeletal examinations at school to allow early detection/treatment of musculoskeletal injury.

Based on this point of view, in Fiscal Year 2005, we, the Kyoto Group (the Subcommittee on the Model Project for Musculoskeletal Examination at Schools, School Health Committee, Kyoto Medical Association), joined a model project organized by the Japanese Committee of Bone and Joint Decade called the “model project to prepare/enhance musculoskeletal examination system at school,” which just started within the same year. Since then, we started the “musculoskeletal examination model project at general schools,” targeting schoolchildren and students from elementary to high schools. We conducted examinations on 1,515 children in 2005, 2,043 in 2006, and 3,594 in 2007, with the understanding and support of many school physicians and school officials.²⁻⁵

Children Found to Have *Stiff Bodies* Based on Musculoskeletal Examination at Schools

There were some ‘surprising’ points in the check-up that I noticed in many children, namely: 1) They could not raise their arms all the way (their shoulder joints were stiff), 2) they could not reach the floor when they bended forward, and 3) they could not squat all the way down to the floor (one example is shown in **Fig. 1**; the agreement was obtained from both the child in the pictures and the parents for publication).

In order to examine the incidence of children with such *stiff bodies*, the Kyoto Group conducted flexibility tests of raising the arms, bending the body forward, and squatting down (**Fig. 2**) during all the school health examinations we conducted in 2008. The data collection has not been completed yet, but here I present the results obtained at some elementary and middle schools.

In elementary schools, we found: 1) 5.4% of children could not raise their arms all the way, 2) 8.0% could not touch the floor when they bended forward, and 3) 5.4% of them could not



Fig. 1 The example of a child who cannot squat down all the way

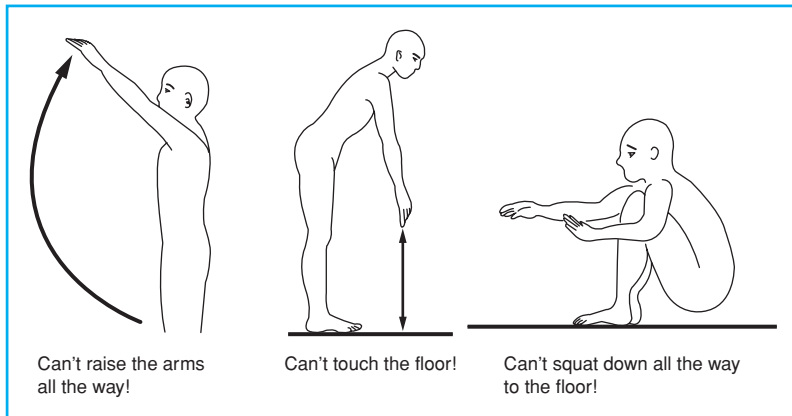


Fig. 2 Flexibility tests: raising both arms (left), bending the body forward (middle), and squatting down (right)

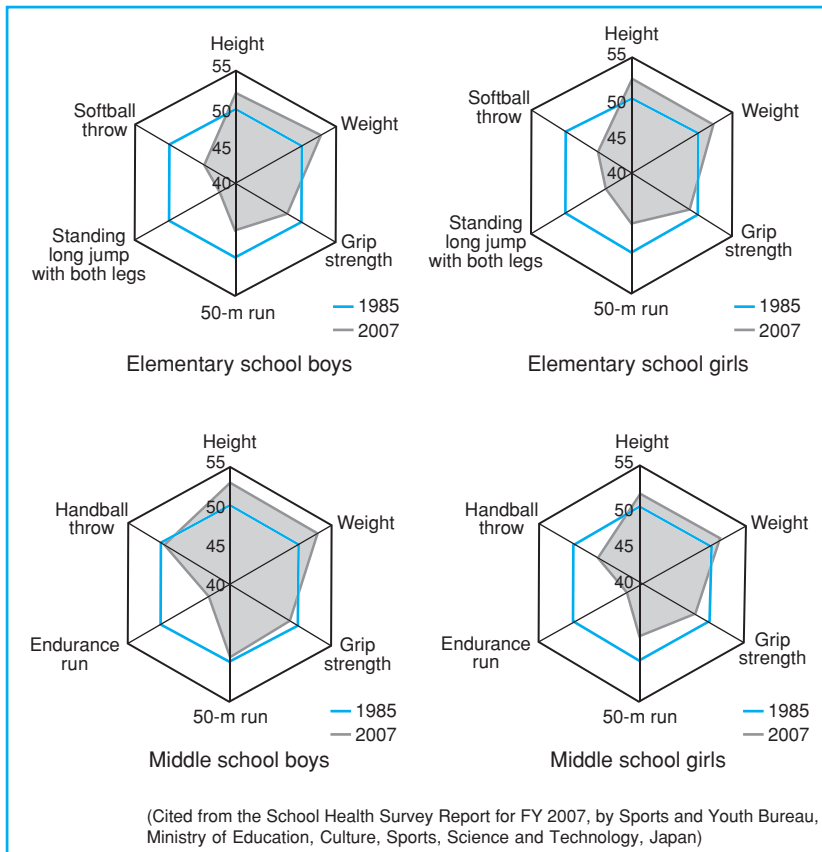


Fig. 3 Comparisons of body size and physical strength between 1985 and 2007

squat down all the way to the floor. In middle schools, same conditions were observed in 12.1%, 9.9%, and 10.6% of the students, respectively—that is, one out of 10 students had a *stiff body*

in general.

These conditions were observed among children regardless of the amount of sports activities. Therefore, it was not possible to conclude if a *stiff*

body was the consequence of lack of physical exercise, excessive physical exercise, or unbalanced growth (or elongation) of bones and muscles. However, we can easily imagine that such *stiff body* conditions are ‘likely to induce injury’ when children perform physical exercise or sports activities.

Needless to say, it is important to partake in sports activities based on appropriate practice schedules to prevent sports-related injuries. In addition, it is crucial not to skip basic training of the body, especially daily stretching or stepwise muscle training.

The Actual Status of ‘Decline in Physical Strength’ among Children, Based on the Results of School Health Survey (Ministry of Education, Culture, Sports, Science and Technology, Japan)

Every year, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan conducts the School Health Survey to examine physical strength and exercise ability among schoolchildren and students. The report from FY 2007 suggested three main issues; 1) physical strength of children has been decreasing since around 1985, 2) the gap in physical strength between the children who are well fit and those who are not has been increasing, and 3) the levels of physical strength among children are correlated with the frequency/duration of exercise activities they practice.⁶

Among elementary school children, their physique (namely body height/weight) has been increasing both in boys and girls since 1985, but their physical strength/ability has been decreasing across all survey items in both genders. A significant decrease was observed particularly in the 50-m run, standing long jump with both legs, and softball throw (**Fig. 3**). The decrease in physical strength/ability has also been observed in middle school students since 1985, however, the extent of the decrease in middle school boys was relatively smaller than that of elementary school boys (**Fig. 3**).⁶

The correlation between the frequency of exercise and the level of physical strength becomes apparent at approximately 8 to 9 years of age, and the such correlation appear to exist until the age of 79. A similar correlation is observed between the duration of exercise per day and the

level of physical strength. However, in terms of the frequency of exercise among elementary school children, the proportion of students who ‘exercise almost every day’ has been decreasing both in boys and girls, especially in girls.⁶

Causes for the Decline in Physical Strength among Children

MEXT has concluded that there are several possible causes for the decline in physical strength among children in Japan. One is the issue of the awareness among Japanese people, that people are neglecting the importance of playing outside/outdoors and participating sports activities. The urbanization and convenient life-styles have changed the living environment, too. Children are exposed to much irregular life-styles now, both in terms of sleep and diet. Various other factors are also involved, and as a consequence, there are fewer opportunities for children to take part in physical exercise nowadays.⁶

Prevention of Musculoskeletal Dysfunction Caused by the Decline in Physical Strength and Lack of Exercise among Children

Regarding the future physical exercise programs, MEXT has suggested the following. For elementary school children, the frequency of physical exercise/sports is an important factor to improve their physical strength. Thus, it is necessary for the families, elementary schools, and local communities to work together in order to increase opportunities for children to participate in physical exercise. For middle school students, the frequency of physical exercise/sports shows a sign of increase. However, the fact remains that the level of physical strength is generally lower than that of 1985, with large decrease in overall stamina. In the future, the detailed investigation on exactly how children participate in physical exercise and sports activities would be necessary in order to evaluate the intensity and the contents of those activities.⁶

MEXT has set the “improvement of physical strength in children through the promotion of sport activities” as the primary goal in its Basic Plan for the Promotion of Sports. Their intention is to control the decreasing tendency of physical strength among children by promoting sports

and to turn it to the increasing tendency through implementing various measures.⁷

I would like to suggest the following six points as “the measures to prevent musculoskeletal dysfunction in children due to lack of physical exercise.”

1. Increase the frequency to play outside/outdoors from infancy.
2. Expose children to many different kinds of sports.
3. Encourage children to discover the joy of physical exercise so that they will voluntarily take part.
4. Ensure as many opportunities and time as possible for children to participate in physical exercise (at home, schools, and in communities).
5. Provide children with the opportunity to receive various instructions based on their levels of development.
6. Make effort to guide each child to improve his/her ability and aptitude.

Mr. Ryu Shionoya, the Minister of Education, Culture, Sports, Science and Technology, made five proposals in early February of 2008 in order to “cultivate the mind” of children, which included the importance of ‘playing outside.’ It is time to bring back the ‘play outside’ in order to cultivate ‘the mind’ and ‘the body.’

Early Detection of Musculoskeletal Dysfunction Caused by Lack of Exercise

Lastly, I would like to describe methods that would allow early detection of musculoskeletal dysfunction caused by lack of physical exercise.

At present, “physical strength/ability test” seems to be the most useful tool for early detection. Poor results of the test would indicate possible *musculoskeletal dysfunction*. However, we should not jump to the conclusion that the cause is ‘lack of physical exercise.’ Other factors such as ‘excessive physical exercise,’ ‘musculoskeletal disease,’ and ‘internal diseases like cardiovascular disease’ must be ruled out first.

The flexibility tests (‘raising arms, bending forward, and squatting down’ (**Fig. 2**), which are performed in musculoskeletal examination by the Kyoto Group, can be used as one of the screening tools for *musculoskeletal dysfunction*. However, as mentioned earlier, these tests do not provide clues to the ‘actual cause of the condition.’ Nonetheless, it is still significant to implement them as ‘the important screening tool to prevent injury.’

An *orthopedic examination*⁸ that checks many additional items is also vital. A modified muscular strength test can also be used in the screening of ‘musculoskeletal dysfunction due to lack of physical exercise.’

The development of a new diagnostic tool that can easily be implemented during a musculoskeletal examination and provides excellent diagnostic ability is expected in the future.

References

1. Matsuura T, Suzue N, Kashiwaguchi S, et al. Results and issues of health examination in outdoor for baseball and football players: Tokushima Prefecture. Feature topic: Musculoskeletal examination at schools: to prevent sports-related injuries and accidents. *Journal of Clinical Sports Medicine*. 2009;26:183–187.
2. Tachiiri K, Fukuda J, Ishii S, et al. A report on model project for musculoskeletal examination at schools: Kyoto Prefecture. In: Japanese Committee of Bone and Joint Decade, ed. FY 2005 Report on “Model Project to Prepare/Enhance Musculoskeletal Examination System at Schools”; 2006:41–52. (in Japanese)
3. Izuchi N, Tachiiri K, Fukuda J, et al. A report on model project for musculoskeletal examination at schools: Kyoto Prefecture. In: Japanese Committee of Bone and Joint Decade, ed. FY 2006 Report on “Model Project to Prepare/Enhance Musculoskeletal Examination System at Schools”; 2007:36–56. (in Japanese)
4. Tachiiri K, Fukuda J, Ishii S, et al. A report on model project for musculoskeletal examination at schools: Kyoto Prefecture. In: Japanese Committee of Bone and Joint Decade, ed. FY 2007 Report on “Model Project to Prepare/Enhance Musculoskeletal Examination System at Schools”; 2008:13–39. (in Japanese)
5. Tachiiri K, Izuchi N. Physical and musculoskeletal examinations at schools: Implementation model of musculoskeletal examination at schools (Cases from Kyoto Prefecture). In: Mutoh Y, Funaguchi S, Uchio Y, eds. Handbook on Musculoskeletal Examination at Schools: Prevention of Sports-related Injury in Growing Children. Tokyo: Nankodo Co., Ltd.; 2007:85–94. (in Japanese)
6. Sports-for-All Division, Sports and Youth Bureau, Ministry of Education, Culture, Sports, Science and Technology. The School Health Survey Report for FY 2007. 2008. (in Japanese)
7. Policy Planning Division, Sports and Youth Bureau, Ministry of Education, Culture, Sports, Science and Technology. The Plan for the Promotion of Sports. 2006. (in Japanese)
8. Nakajima H. Medical examination with sports orthopedic aspects. *Journal of Clinical Sports Medicine*. 1985;2:735–740. (in Japanese)