

Analysis of Physical Factors According to School Facility Opening of Elementary School Students

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Purpose The purpose of this study is to find out the difference in cardiorespiratory endurance, flexibility, and muscular strength and muscular endurance according to the opening of the playground, gymnasium, and auditorium in the 5th and 6th grades of elementary school. **Methods** This study was based on statistical data provided by the EDSS provided by KERIS. The data on cardiopulmonary endurance, flexibility, and muscle strength and muscular endurance of 413 female students and 413 male students were analyzed for 400 5th graders and 420 6th graders nationwide. **Result** There were statistically significant differences in cardiorespiratory endurance, flexibility, and muscular endurance among female students in terms of physical factors according to whether or not the playground was opened ($p < 0.05$), and there were significant differences in cardiorespiratory endurance, muscular strength, and muscular endurance among male students in female students, cardiorespiratory endurance according to gym opening was higher than unopened, so there was a statistically significant difference ($p < 0.05$). In addition, in male students, there was a statistically significant difference in the strength and endurance according to the gym opening because the gym opening was higher than the gym open ($p < 0.05$). However, there was no statistically significant difference in cardiorespiratory endurance, flexibility, and muscular endurance according to the opening of the auditorium in female students. In addition, there was a statistically significant difference in cardiorespiratory endurance according to the opening of the auditorium in male students, as the opening of the gymnasium was higher than that of the open auditorium ($p < 0.05$). **Conclusion** The conclusion of this study is that the opening of school facilities in sports fields, gym, and auditorium has a positive effect on the improvement of cardiorespiratory endurance, flexibility, and muscular and muscular endurance of elementary school students.

Key words Cardiopulmonary endurance, Flexibility, Muscular strength, Elementary school students

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1. Introduction

Children in the most important period of physical development experience natural cognitive, physical and social skills development in the living environment through physical play and movement, and exposure to the outdoor environment provides more experience, intellectual growth, and cognitive learning.¹⁾

Since physical strength is not only muscle, height, and physiological function, but also the overall ability of the body,²⁾ physical activity plays a very important role in maintaining and promoting health, growth, and schooling through the use of skeletal muscles, and

jumping and walking. Through this, children's self-esteem is enhanced and mental health is expected to improve through positive self-image.³⁾ In addition, the increase in physical activity can be expected to improve long-term health status and improve neuro-cognitive ability related to anxiety, depression, self-esteem and social integration.⁴⁾

Because healthy physical strength makes a healthy mind, strengthening physical strength through constant physical activity promotes physical health improvement and emotional well-being, regardless of age or body type, so that you can wear pretty clothes, strengthen muscle strength, strengthen your skeleton, improve skin, relax muscles, it promotes sleep, mood improvement and immune function.⁵⁾

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Regular exercise is performed for a number of reasons, such as promoting growth and development, preventing aging, strengthening the muscles and cardiovascular system, improving motor skills, losing or maintaining weight, and changing mood.⁶⁾

Physical activity is largely classified into four basic categories: endurance, strength, balance and flexibility. Different types of physical activity can harmonize physical activity to reduce boredom and prevent sports damage.^{7, 8)}

Physical activities through school facilities not only provide good opportunities to help children increase their physical activities necessary for basic motor skills, but also the educational environment through physical education classes improves satisfaction with basic physical needs and promotes mood change.⁹⁾

Cardiopulmonary endurance is an exercise ability that can be performed with submaximal intensity from medium to high intensity movements for a relatively long period of time.¹⁰⁾ Therefore, regular physical activity helps the heart to provide optimal blood supply, maintain adequate cholesterol, maintain blood vessel flexibility, maintain normal blood flow and blood pressure, reduce body fat, strengthen heart muscle and maintain health for a long time.^{11, 12)} In addition, regular physical activity increases breathing and heart rate in endurance and aerobic exercise through walking and jogging, mowing, scraping, digging and dancing in daily life, thereby maintaining healthy heart and pulmonary circulatory system to increase whole body endurance.¹³⁾

Flexibility is related to the range of motion of the joints of the body and helps to stretch muscles and keep the body flexible, making various sports activities and daily life easier.¹⁴⁾

Muscular endurance is divided into two according to its shape, and one is static muscle endurance, which is the ability to withstand a load of a certain weight by exerting strength without changing the length of the muscle, and the rest is exhausted with a proper weight in a constant rhythm Dynamic muscle endurance is the ability of muscles to repeat several times.¹²⁾

In recent studies, there are almost no studies on

the health benefits related to physical activity of elementary school girls. In particular, few studies use objective measures of physical activity and physical fitness in children and children.⁴⁾

As mentioned earlier, the educational curriculum of elementary school students in recent years has neglected physical education programs, and the situation is biased toward academic education while sitting at a desk. Children's neglected physical activity and mental health endanger society and educational reality. And physical health, mental health, and academic achievement are closely related to each other.

Therefore, this study aims to provide basic data necessary for the development of educational programs for elementary school students by analyzing the actual condition of the physical factors of elementary school students according to the opening of school facilities, and by analyzing the differences in physical factors for each school facility.

II. Materials and Methods

1. Subjects

This study analyzed the data of 400 elementary school 5th graders and 420 6th graders nationwide, and 413 female students and 413 male students using statistical data provided by the Edu Data Service system(EDSS) provided by the Korea Education and Research Information Service(KERIS). The data of physical activity promotion system(PAPS), which was implemented from 2014 to 2018, were evaluated and analyzed.

2. Procedure

This study was used as data provided by the Edu Data Service (EDSS) operated by the Ministry of

Table 1. General characteristics

Division	Subject	Number	Ratio(%)
Grade	5th grade	400	48.8
	6th grade	420	51.2
Gender	Boy	407	49.6
	Girl	413	50.4

Education and the Korea Education and Research Information Service (KERIS). The relationship between physical fitness factors according to the openness of sports fields, auditoriums, and gymnasiums was compared based on the data for girls in the 5th and 6th grades of elementary schools nationwide from 2014 to 2018, which received the educational field data for academic purposes. In the reciprocating long run (pacer), cardiopulmonary endurance was measured by measuring the ability to run by periodically reciprocating 15m, flexibility was measured by a functional stretch test, and muscle strength and muscle endurance were measured by a strength test.

3. Data analysis

In this study, the SPSS 18.0 statistical program was used, and an independent t-test was conducted to determine the differences between groups according to the openness of school facilities in each measurement item, and to verify statistical significance. The level(α) was set to 0.05.

III. Results

1. Analysis of physical factors according to whether elementary school students open their playgrounds

In the results of the study, in Table 2, there were significant differences in cardiopulmonary endurance, flexibility, and muscular endurance in female students in terms of physical factors according to whether or not female students and boys open the playground($p < 0.05$), and in male students in cardiopulmonary endurance, muscle strength, and muscle endurance. There was a significant difference($p < 0.05$), but there was no difference in flexibility.

2. Analysis of physical factors according to whether elementary school students are open to gym

Table 3 shows the results of physical fitness factors depending on whether elementary school students open the gymnasium. There was a significant difference in cardiopulmonary endurance according to the opening of the gymnasium for elementary school

Table 2. Comparison of changes depending on whether or not the playground is open

Division	Unopen(n=410)	Open(n=410)	t	p
Cardiopulmonary endurance (sec)	70.61±16.91	61.12±20.54	7.214	.000
Girl flexibility (cm)	14.06±2.51	14.78±4.91	-2.652	.000
muscular strength. Muscle endurance (score)	19.93±2.94	23.14±4.24	-12.565	.000
Cardiopulmonary endurance (sec)	83.02±18.18	68.07±20.94	10.916	.000
Boy flexibility (cm)	8.37±2.26	8.79±4.77	-1.600	.110
muscular strength. Muscle endurance (score)	21.75±3.72	24.53±5.32	-8.652	.000

Table 3. Comparison of changes depending on whether the gym is open or not

Division	Unopen(n=410)	Open(n=410)	t	p
Cardiopulmonary endurance(sec)	63.50±18.86	66.46±17.08	-2.360	.019
Girl flexibility(cm)	14.37±3.78	14.62±3.81	-.966	.334
muscular strength. Muscle endurance(score)	21.83±4.99	22.43±4.01	-1.894	.059
Cardiopulmonary endurance(sec)	75.92±20.04	74.51±18.99	1.035	.301
Boy flexibility(cm)	8.76±3.69	9.06±3.95	-1.110	.267
Muscular strength. Muscle endurance(score)	22.62±3.75	23.61±4.16	-3.588	.000

Table 4. Comparison of changes depending on whether or not the auditorium is open

	Division	Unopen(n=410)	Open(n=410)	t	p
	Cardiopulmonary endurance(sec)	63.54±20.15	65.41±18.16	-1.401	.162
Girl	flexibility(cm)	14.28±4.10	14.77±3.84	-1.781	.075
	muscular strength. muscle endurance(score)	22.31±4.83	22.136±3.59	.595	.552
	Cardiopulmonary endurance(sec)	77.21±21.21	81.46±20.23	-2.941	.003
Boy	flexibility(cm)	8.62±2.64	8.30±2.59	1.741	.082
	muscular strength. Muscle endurance(score)	21.03±3.62	20.98±3.34	.240	.811

girls($p < 0.05$), and there was no significant difference in flexibility and muscular endurance. In addition, there was a significant difference in muscle strength and muscle endurance according to the gym opening in elementary school boys($p < 0.05$), and there was no significant difference in cardiopulmonary endurance and flexibility.

3. Analysis of physical factors according to the auditorium opening of elementary school students

Table 4 shows the results of physical fitness factors depending on whether elementary school students open the gymnasium. There was no significant difference in cardiorespiratory endurance, flexibility, and muscular endurance according to auditorium opening in elementary school girls. In addition, there was a significant difference in cardiorespiratory endurance according to the opening of the auditorium in elementary school boys than in the opening of the auditorium($p < 0.05$), but there was no significant difference in flexibility, muscle strength, and muscle endurance.

IV. Discussion

The school playground serves as an important space in children's daily life and is a space where students learn to take responsibility for physical, emotional, social and social interaction, emotional sharing, cooperation, empathy with others, and actions.¹⁵⁾

Clark et al¹⁶⁾ studied studied playground function, open sports facilities, aerobic exercise, school environ-

ment, and characteristics of elementary school students among 2,381 children attending urban public schools in St. Louis, Missouri, USA.

Female students showed significant differences in cardiopulmonary endurance, flexibility, and muscular endurance in the physical factors of this study according to whether or not the playground was opened, while male students showed significant differences in cardiopulmonary endurance, muscle strength, and muscular endurance, but there was no significant difference in flexibility. This is thought to be an improved change in cardiopulmonary endurance, flexibility, muscle endurance, sensory characteristics, social interaction, self-regulation, physical activity skills, and behavioral coding system, as the opening of the playground has a more positive effect on the improvement of female students' physical activity.

Määttä et al¹⁷⁾ studied the relationship between physical activity and school environment in 778 children, and said that school facilities and playgrounds for various physical activities help increase physical activity.

Jones et al¹⁸⁾ studied the relationship between basic motor skills and physical activity, and said that active physical activity improves basic motor skills.

Participation in physical activity is the best way to solve the social problems of obesity and low physical strength and prevent them from occurring. This is why many treatments for obesity recommend that obese persons participate in physical activity.¹⁹⁾ In addition, having obese and low-physical students positively recognize and actively participate in physical activities not only meets the social demand for solving

physical and mental problems of obese students, but also an opportunity to lead a healthy life for them. It is a very important thing in terms of providing a product.²⁰⁾

In the physical factors according to whether the gymnasium was opened or not in this study, there was a significant difference in cardiopulmonary endurance of female students in open rather than unopened, but there was no significant difference in flexibility and muscular endurance. Also, in male students, there was a significant difference in muscle strength and muscle endurance in open than in unopened, but there was no significant difference in cardiopulmonary endurance and flexibility.

Miller et al¹⁰⁾ target 41 children with developmental disabilities in the school playground, and the behaviors related to sensory functions, social interactions, self-regulation, physical activity skills, and play level were evaluated as exercise planning and self-esteem, social interaction, and regulatory recovery, it was studied that it is helpful in improving self-esteem and posture.

There were significant differences in cardiorespiratory endurance, flexibility, muscle strength, and muscular endurance of students according to the open field of this study. Although it is not known whether the presence or absence of auditorium opening directly affects cardiopulmonary function, flexibility, and spontaneity, auditorium opening is thought to have an effect by inducing active physical activity of children.

Ha²¹⁾ presents the results of a study that the period of participation in physical activity affects the improvement of children's basic physical strength. Insane is partially consistent with the research results.²²⁾

The results of this study show that the opening of school facilities in sports fields, gymnasiums, and auditoriums had a positive effect on the improvement of cardiorespiratory endurance and flexibility, muscle strength and muscular endurance of elementary school students, but according to the control of the activity time and individual activity characteristics of elementary school students.

Research needs further study. Based on the data of this study, the effective operation of school facilities

related to physical fitness improvement of elementary school students in the future, and data on objective and standardized research that classifies elementary school students' social development, interpersonal relationships, emotions, regulation, physical activity, play, communication, and emotions It is expected to be used as.

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