



Developing the Calisthenics Exercise Program to Improve Physical Fitness of the Primary School Students

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Abstract

Background and Aim: Calisthenics exercises improve body composition, flexibility, cardiovascular health, muscle strength, and mental health across various populations. This study's objective was to develop the physical fitness of primary school students by participating in a calisthenic exercise training program during the after-school period.

Materials and Methods: This research was quasi-experimental research, in which two groups pretest and a posttest conducted a calisthenic exercise training program during the after-school period. The subjects were 60 students in grade 5th in primary school with simple random sampling. They were divided into two groups by systematic sampling technique based on physical fitness test scores. The experiment operated for 8 weeks, 3 sessions a week with 60 minutes per session. The experimental group trained with a calisthenic exerciser training program developed by the researchers, the content validity was 95 (.66-1.00). The control group was assigned to participate in sports and exercise programs provided by the school on the after-school partitivities to responds to the “Double Reduction Policy”. The physical fitness tests were examined on pre-test and post-test. The data were analyzed by mean and standard deviation, comparing the mean between the group with t-test independent and within the group with pair t-test (*p<.05).

Results: found that 1) The mean comparison of physical fitness between the experimental and control group was a significant difference in 50 meters sprint, standing long jump, sit and reach, push-ups, and distant 600 meters run (*p<.05), but 30 seconds sit-ups and shuttle runs were not a significant difference. 2) The physical fitness of the experimental group in the posttest was better than in the pretest in all items (*p<.05).

Conclusion: The calisthenic exercise could effectively improve physical fitness in primary school students. However, some components of physical fitness must select a specific type or movement in calisthenic exercise to improve them.

Keywords: Calisthenic Exercise; Physical Fitness Training Program; Primary School Students

Introduction

Some studies suggest that the physical fitness of primary school students in China is a problem due to low physical activity levels and high rates of overweight and obesity, while other studies indicate improvements in fitness during and after the COVID-19 pandemic. The decline in physical fitness over time, there has been a general decline in the physical fitness index (PFI) of Chinese students from 1985 to 2014, with a notable drop in both undernourished and overnourished students (Dong et al, 2019). Urban students have shown significantly lower physical fitness levels compared to their rural counterparts, with urbanization contributing to this decline (Tian et al, 2021). The impact of the COVID-19 pandemic led to mixed outcomes in physical fitness. While some aspects like BMI increased, other fitness measures such as lung capacity and rope-jumping performance improved due to home-based fitness programs (Hu et al, 2022). Physical activity levels, only about 31% of Chinese students meet the recommended levels of moderate-to-vigorous physical activity (MVPA), with boys generally being more active than girls (Wang et al, 2017). Urban students tend to engage in more physical activity than rural students, although rural students have better overall physical fitness (Zhu et al, 2019). The physical fitness of primary school students in China is indeed a concern, with a general decline observed over the past few decades. Urbanization, lifestyle changes, and the COVID-19 pandemic have all played significant roles in shaping the current state of physical fitness. While urban students tend to engage in more physical activity, their overall fitness levels are lower compared to rural students. Intervention programs and policies promoting





physical activity, reducing screen time, and encouraging healthy lifestyles are essential to address this issue and improve the physical fitness of Chinese primary school students.

To improve the physical fitness of primary school students, a multi-faceted approach is recommended. Integrating strength and skill-based training, incorporating physical activity games, and implementing functional training programs within PE classes can significantly enhance various fitness parameters. Additionally, school-based physical activity programs, physically active academic lessons, and extracurricular sports training can further support these improvements. Adapting school uniforms to be more conducive to physical activity and leveraging health promotion programs, could also contribute to better physical fitness outcomes for primary school students. Such as integrating strength and skill-based exercises into physical education (PE) classes can significantly improve aerobic capacity, muscular fitness, and flexibility in primary school children (Faigenbaum et al, 2015). School-based physical activity interventions, including additional sessions of moderate to vigorous physical activity (MVPA), can improve motor abilities, physical fitness, and self-efficacy in children (Neil-Sztramko et al, 2021).

Calisthenics exercise is a conditioning exercise by the use of one's body weight. Calisthenics originated in Ancient Greece and remains popular today. Most people can perform these exercises, regardless of the level of their athletic ability. Many of them do not require any equipment. Calisthenics is very convenient for every person to use for exercise because they do not need any equipment, you do many repetitions of each move to help build muscle while improving how long you can keep the exercise going. Calisthenics can be a warm-up or cool-down for another fitness routine or sport. Most calisthenic exercises use body weight as a means to use as weight training. A conditioning workout program was more than just cardiorespiratory improvement. While it could build your endurance, it also involved building strength, speed, agility, and mobility. Similar to cardio, it improves heart and lung function, but a total-body conditioning workout took things a step further by introducing movements and intensity that could allow one to work harder and perform better in his/her workouts, for longer periods. Conditioning exercises were used to strengthen your muscles and joints, improving your mobility. We all moved around the place as we completed our day-to-day obligations, so we all could benefit from making strength and conditioning part of our workout routine. Conditioning improves the quality of one's movements, which helps to improve athletic performance. It could considerably impact a person's quality of life, like making it easier for older people to move around. Conditioning exercises also help to develop better movement patterns which reduces your risk of injury. For example, an older person who regularly worked on their strength and conditioning was less likely to fall and hurt themselves. Conditioning training improves physical fitness across various groups, including student-athletes, fighters, firefighter trainees, law enforcement recruits, fitness center participants, and athletes in different sports (Landicho & Andal, 2023).

Calisthenics exercises, which utilize body weight for resistance, have been studied for their potential benefits on various aspects of physical and mental health. This synthesis examines the effectiveness of calisthenics exercises in improving body condition, including body composition, physical fitness, and other health parameters, which significantly improve body composition indices such as weight, body mass index (BMI), waist circumference, hip circumference, and waist-to-hip ratio. These exercises also enhance flexibility, muscular endurance, and cardiovascular endurance (McDaniel et al, 2020). Blood Sugar and Blood Pressure: Calisthenics exercises can lead to significant improvements in blood sugar levels and systolic blood pressure, although they may not significantly affect HDL and LDL cholesterol levels (Kamat et al, 2023). Neuromuscular Function: Regular calisthenics can improve neuromuscular function, including increased muscle strength, force steadiness, and dynamic balance (Mear et al, 2022). Mental Health and Stress Reduction: Calisthenics exercises have been shown to reduce stress and improve mental health, which can help in treating conditions like depression and anxiety (Rajakumari & Pandiammal, 2020). Effectiveness in Specific Populations: For individuals with type 2 diabetes mellitus, calisthenics exercises can improve glycemic control and reduce body fat percentage more effectively than some other forms of exercise like Pilates (Kamat et al, 2023). In patients with conditions like ankylosing spondylitis, calisthenics can improve mobility, functionality, and psychological status (Aydın et al, 2016). Calisthenics exercises





are effective in improving various aspects of body condition, including body composition, physical fitness, blood sugar levels, and mental health. They are particularly beneficial for specific populations such as those with type 2 diabetes and ankylosing spondylitis. Combining calisthenics with other forms of exercise can further enhance these benefits. Overall, calisthenics exercises are a versatile and effective option for improving overall body condition.

Applying calisthenic training to improve the condition of the body was reasonable to cultivate students' lifelong exercise according to the ease of exercise at any place, any time with fewer devices. Safe, no expense, and usefulness. The Chinese Government set the “Double Reduction” policy, to reduce academic activities in the classroom and add extracurricular exercises for students, The schools had to develop off-class activities for students after class. The primary school students were interested in physical exercise, the physical conditioning was a physical exercise that could serve the student's needs. The calisthenic was very useful in cultivating them to have good health and could teach them the ways to exercise with less equipment and safe expense which they could do for lifelong.

Researchers understand the benefits of promoting the health of primary school students by participating in physical exercise, understand the benefits of physical conditioning by calisthenic exercise, and respond to the “Double Reduction Policy in Schools”. So, the researcher proposed the research on “Developing Calisthenic Exercise Program to Improve Physical Fitness in Primary School Students”

Objectives

1. To develop the calisthenic exercise program to improve physical fitness in primary school students
2. To study the effects of the calisthenic exercise program on physical fitness.
3. To compare physical fitness between experimental and control groups and within groups.
4. To evaluate the usefulness, practicality, and satisfaction of the program by students who participate in the training program.

Literature review

Principles and practice on the calisthenic exercise

Calisthenics is an effective physical activity for the improvement of postural sway, and endurance and has a positive effect on body composition, significantly reducing body fat mass. Calisthenics was a term used to define a generic set of body weight exercises. Such a term is now used to define a worldwide spread discipline based on body weight and gymnastics exercises. Calisthenics training is a feasible and effective training solution to improve posture, strength, and body composition without the use of any major training equipment. (Thomas et al, 2017). The term calisthenics originally referred to a set of body weight exercises used in the United States to improve the general fitness level of female schoolchildren. The calisthenics originated from Greek which means beauty and strength. The term calisthenic incorporates skills from dance and gymnastics and has been generalized to a set of bodyweight skills aiming to improve health and fitness. These exercises have been used in different environments such as medical, military, and schools to improve individual physical features. (Cui et al, 2011)

Advantage of Calisthenic Exercise, Kari Hartel (2024) presented in “Top 10 Benefits of Calisthenics” as follows: tones your core and all those small muscles, then calisthenics could improve a variety of muscle groups with a single exercise. Many types of gym equipment limit what muscle groups are targeted and they mainly target large muscle groups. They could engage numerous muscle groups all at once, you develop proprioceptive awareness, also known as muscle memory. Calisthenics exercises also require core strength. You might be surprised to learn that your core houses 29 small muscles, all of which are engaged and strengthened through calisthenics.





The benefit of Physical Activities and Child Development, the topics “Physical Activity, Fitness, and Physical Education: Effects on Academic Performance” (Kohl et al,2013) stated the key words concerned the physical activity could affect academics in some evidence as the following: 1) Evidence suggests that increasing physical activity and physical fitness may improve academic performance and that time in the school day dedicated to recess, physical education class, and physical activity in the classroom may also facilitate academic performance. 2) Available evidence suggests that mathematics and reading are the academic topics that are most influenced by physical activity. These topics depend on efficient and effective executive function, which has been linked to physical activity and physical fitness. 3) Executive function and brain health underlie academic performance. Basic cognitive functions related to attention and memory facilitate learning, and these functions are enhanced by physical activity and higher aerobic fitness. 4) Single sessions of and long-term participation in physical activity improve cognitive performance and brain health. Children who participate in vigorous- or moderate-intensity physical activity benefit the most. 5) Given the importance of time on task to learning, students should be provided with frequent physical activity breaks that are developmentally appropriate. 6) Although presently understudied, physically active lessons offered in the classroom may increase time on task and attention to task in the classroom setting. 11 of 14 correlational studies of physical activity during the school day demonstrate a positive relationship to academic performance. 7) Children respond faster and with greater accuracy to a variety of cognitive tasks after participating in a session of physical activity. And 8) Several reviews and meta-analyses have described the relationship among physical fitness, physical activity, and cognitive (broadly defined as all mental processes). The majority of these reviews have focused on the relationship between academic performance and physical fitness

Physical education and sports promotion in school, there are many strategies to promote physical and sports in schools, and here are some of the principles 1) Given the importance of school sports, all schools are expected to promote sports and make sure that the school environment is favorable for sports development activities; teachers, parents, districts, and the community at large will have to play a role to make sure that school children benefit fully from physical activities and sports. 2) A sports promotion in school must provide equal opportunity for all children, girls, and boys will be stimulated to practice sports. 3) There are adequate and sufficient sports facilities available, enough sports courts, areas, equipment, and materials. 4) There is competent technical staff to support sports. 5) There are courses, and lessons, for teaching and learning both requirements and electives for students. 6) Developing projects, training, and examining the talents of young children are detected and developed. 7) The schools must provide both exercise and sports in curriculum and extracurricular activities. 8) Pay attention to physical literacy, sport for all, basic sports skills, and sport for excellence. 9) Manage a network with outside communities, sports clubs, sports academies, and organizations to cooperate working to promote sports for students and teenagers. And 10) apply the Long-Term Athlete Development model to be a concept to promote sport and exercise in schools. Regular participation in sports and exercise is one of the most important daily activities that can improve and maintain everybody’s health status. Being physically active can improve your body and mind fitness, control weight, reduce the risk of disease, strengthen bones and muscles, and improve your ability to do daily activities. Cultivating sports, exercise, and physical activities in students is a strategy of education to grow the children and hope to engage them in lifelong daily activity. Physical education aims to develop students' physical competence and knowledge of movement and safety, and their ability to use these to perform in a wide range of activities associated with the development of an active and healthy lifestyle through participation in selected exercises, sports, and games. One of the popular sports in classes is Wushu which most educational institutes from primary schools through university, usually put in the curriculum. And extra curriculum activities. The primary school period is very important to cultivate and adhere to sports and other behaviors. However, there is no appropriate management on Wushu promotion to gain more occasions for the students to participate and develop. The development of the sport from fundamental sports skills to sports for excellence with the cooperation of family level, schools, communities, province, region, national and international levels (Tasnaina & Tasnaina, 2023)



Conceptual Framework

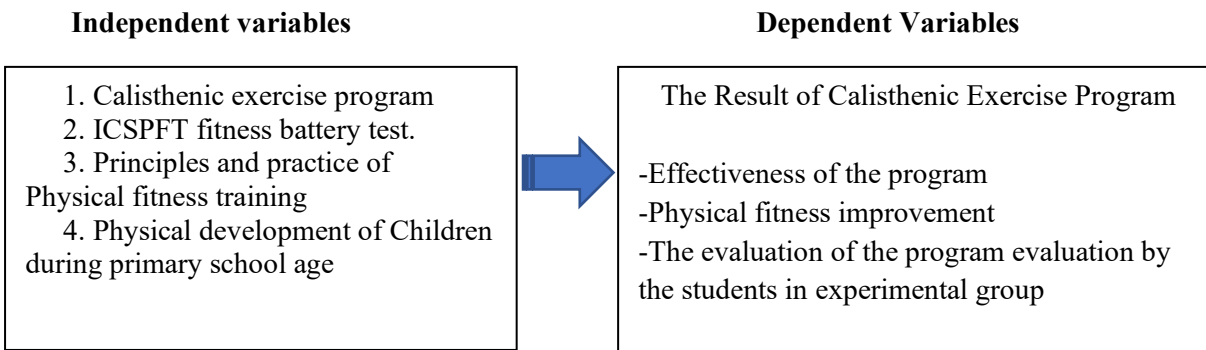


Figure 1 Conceptual Framework

Methodology

Population and sample

The population was primary school students in Guangzhou. There were 12 primary schools, researcher selected them by simple random sampling and got Guangzhou school there were 12 classes, and the students were a total of 1100 students.

The sample was simple random sampling from the grade 5th which had two classes with 60 students. The students were tested physical fitness tests, ranked the scores, and systematic sampling into groups, 30 each, then drawn to be experimental and control groups.

Research Design

This research was quasi-experimental research with two groups pre-test and post-test.

Research Instrument

Instruments in this research were such as:

1. Calisthenics exercise program to improve physical fitness for primary school students. The program was 8 weeks, 3 days a week with 1 hour a session, the exercise program was executed after school on Monday Wednesday, and Friday from 4.00-5.00 PM. Content validated with 5 experts by the index of items objective congruence method (IOC) was 95. Then it try out with 5 students, and 9 students to check the communication and practical procedure.

2. Physical fitness tests were selected from the ICSPF Battery test, such as 50 meters sprint (seconds), standing long jump (cm), 30 seconds sit-ups (frequencies), sit and reach (cm), push-ups (frequencies), shuttle runs (seconds) and distant 600 meters run (min).

3. Likeke scales questionnaire to evaluate the calisthenics exercise program by students in the experimental group.

Data collection

The researchers conducted the data collection process as follows:

1. Interview 9 experts with interviewing form concerned with the calisthenic applied to exercise by primary school students

2. Physical fitness tests to tests at pre-test and post-test.

3. Questionnaire to evaluate the training process from students in the experimental group.

Data Analysis

1. Descriptive statistic: Mean, and standard deviation to analyze the data on the evaluated program process

2. t-tests independent to analyses the physical fitness between experimental and control group

3. Pair t-test to analyze the physical fitness within the group.

4. Set the significant difference criteria at.05.

Research results

The research results support the hypothesis that:

1. Students in the experimental group had better physical fitness than the control group.

2. Students had better post-test physical fitness than pre-test.

Table 1 Comparison of physical fitness between the control group and experimental group on pre-test by Independent t-test.

Variables	Control group (n=30)		Experimental group (n=30)		t	p
	\bar{x}	SD	\bar{x}	SD		
50 meters sprint (seconds)	8.67	0.64	8.44	0.65	1.42	.93
Standing Long Jump (cm.)	160.60	12.87	157.57	14.13	0.87	.64
30 seconds Sit-ups (Frequencies)	19.40	4.32	19.87	4.15	0.43	.50
Sit and reach (cm)	32.62	2.63	33.41	2.56	1.18	.14
Push-ups (Frequencies)	12.70	2.03	12.40	2.37	0.23	.53
Shuttle runs (seconds)	11.59	1.87	11.62	2.24	0.60	.61
Distant 600 meters run (min)	2.70	0.44	2.70	0.50	0.60	.42

*p>.05

Table 1 found that there was no significant difference in all of physical fitness.

Table 2 Comparison of physical fitness between the experimental group and control group on post-test by independent t-test.

Variables	Experimental group (30)		Control group (30)		t	p
	\bar{x}	SD	\bar{x}	SD		
50 meters sprint (seconds)	7.71	0.66	8.46	0.56	- 4.80	.01*
Standing Long Jump (cm.)	168.57	13.55	164.93	13.64	3.18	.01*
30 seconds Sit-ups (Frequencies)	21.56	3.64	20.26	4.29	1.26	.21
Sit and reach	35.31	2.37	33.46	2.37	3.05	.01*
Push-ups (Frequencies)	15.40	2.72	13.27	1.92	3.50	.01*
Shuttle runs (seconds)	10.84	1.69	11.39	1.77	-1.23	.22
Distant 600 meters run (min)	2.20	0.41	2.62	1.38	-2.90	.05*

*p<.05

Table 2 found that physical fitness was a significant difference in the 50-meter sprint, standing long jump, sit and reach, push-ups, and distant 600-meter run (*p<.05), but 30-second sit-ups and shuttle runs were not significant differences.

Table 3 Comparison of physical fitness between pre-test and post-test of the control group by paired t-test

Variables	Post-test (n=30)		Pre-test (n=30)		t	p
	\bar{x}	SD	\bar{x}	SD		
50 meters sprint (seconds)	8.47	0.55	8.68	0.65	3.24	.01*
Standing Long Jump (cm.)	164.93	13.64	160.60	12.87	5.64	.01*
30 seconds Sit-ups (frequency)	20.27	4.29	19.40	4.32	3.71	.01*
Sit and reach (cm)	33.46	2.37	32.62	2.63	5.91	.01*
Push-ups (Frequencies)	13.27	1.93	12.70	2.03	3.45	.01*
Shuttle runs (seconds)	11.39	1.78	11.58	1.87	2.14	.04*
Distant 600 meters run (min)	2.62	0.38	2.70	0.44	2.45	.02*

*p<.05

Table 3 found that there was a significant difference in all physical fitness (*p<.05).



Table 4 Comparison of physical fitness between pretest and post-test of the experimental group by pair t-test

Variables	Post-test (n=30)		Pre-test (n=30)		t	p
	\bar{x}	SD	\bar{x}	SD		
50 meters sprint (seconds)	7.71	0.66	8.44	0.56	10.51	.01*
Standing Long Jump (cm.)	168.57	13.55	157.57	14.14	10.28	.01*
30 seconds Sit-ups (Frequencies)	21.57	3.64	19.87	4.15	5.82	.01*
Sit and reach (cm)	35.31	2.37	33.41	2.56	2.71	.01*
Push-ups (Frequencies)	15.40	2.72	12.40	2.37	10.15	.01*
Shuttle runs (seconds)	10.84	11.82	11.82	1.87	7.29	.01*
Distant run (min)	2.20	0.41	2.70	0.50	6.90	.01*

*p<.05

Table 4 found that there was a significant difference in all physical fitness (*p<.05).

The Evaluation of the usefulness, practicality, and satisfaction by the subjects in the experimental group

After the finished experiment researcher collected data from subjects in the experimental group by questionnaire on the issues of usefulness, practicality, and satisfaction.

1. High Satisfaction ($\bar{x} \geq 4.5$), The process of teaching by demonstration, practice, and training was made more understandable and skillful (4.87 ± 0.34), The teacher paid attention to lead this exercise program (4.83 ± 3.80), The game which teachers used in teaching was fun and made you try more effort (4.57 ± 0.57), You will participate this program in next semester and Calisthenic exercise was very useful to improve physical fitness and could use for lifelong (4.63 ± 0.49)

2. Moderate Satisfaction ($4.0 \leq \bar{x} < 4.5$), You understand and are skillful in calisthenic exercise (4.33 ± 0.76), You are satisfied with the process and contents of this program (4.47) and One hour a session was enough, and made moderate tiered (4.17 ± 0.51)

3. Lower Satisfaction ($\bar{x} < 4.0$), The calisthenic exercise made you gain a more active life (3.96 ± 0.61), and the exercise should be set to be routine for all students (3.93 ± 0.69)

Overall Observations: Participants responded very positively to the teaching methods, the teacher's attentiveness, and the games incorporated into the program. They also found the calisthenic exercises useful and expressed a willingness to continue participating. The areas with slightly lower scores suggest potential for improvement, such as increasing the perceived impact of an active lifestyle and garnering stronger support for making exercise a regular part of the curriculum. (Table 5)

Table 5 The Evaluation of the usefulness, practical, and satisfaction by the subjects in the experimental group

No	Items	\bar{x}	SD
1	You understand and are skillful in calisthenic exercise	4.33	0.76
2	The calisthenic exercise was very useful in improving physical fitness and could be used for lifelong	4.63	0.49
3	The calisthenic exercise made you gain a more active life	3.96	0.61
4	The process of teaching by demonstration, practice, and training was made more understandable and skillful	4.87	0.34
5	The game that teachers used in teaching was fun and made you try more effort	4.57	0.57
6	One hour a session was enough and made moderately tiered	4.17	0.46
7	The exercise should be set to be a routine for all students	3.93	0.69
8	The teacher paid attention to lead this exercise program	4.83	0.80
9	Are you satisfied with the process and contents of this program	4.47	0.51





No	Items	\bar{x}	SD
10	You will participate this program in next semester	4.63	0.49

Discussion

The result of the research showed that calisthenic exercise could improve the physical fitness of primary school students and they appreciated in participate this exercise. On the physical fitness test results. There were most physical fitness test results were improved both in the experimental group and control group but the experimental group was more improvement the in the control group on 50 meters sprint (seconds), standing long jump (cm.), push-ups (frequencies), and distant 600 meters run (min). But on height, weight, BMI, sit-ups (frequencies), and shuttle runs (seconds) were not different.

1. Why were there differences in physical fitness between the posttest and the pretest in both group of experiment group and the control group?

The results in the posttest on physical fitness were better than in the pretest for both the experimental group and the control group because in the period 10-14 age group which was referred to as early adolescence. These years were an exciting time of many changes for the children. They would grow taller and stronger and also start to feel and think in more mature ways and turn into adults. Growth in body parts may occur out of sync with each other. For example, the nose, arms, and legs may grow faster than the rest of the body. Other physical development during puberty usually includes: Bone growth. This increases your child's height. An increase in skull bone thickness. The forehead becomes more prominent, and the jaw grows forward., Weight gain. A child's weight almost doubles during adolescence. An increase in the size of organs. The heart doubles in weight, and lung size increases. (Healthlinkbc.ca, 2024) So they would grow a high improvement in physical fitness, muscle mass, and bone. Endurance This made the result of the physical fitness test results of both groups better in the posttest than in the pretest. Some reports showed that calisthenic exercise can improve various aspects of physical fitness, including flexibility, muscular endurance, cardiovascular endurance, and muscle strength, in primary school students (Guerra et al, (2019).

2. Why some physical fitness test results of the experimental group were better than those in the control group but some were not different?

The results of the posttest on the physical fitness of the experimental group were better than in the control group on 50 meters sprint, standing long jump, push-ups, and distant 600 meters run, these showed that calisthenic exercise could improve physical fitness in primary school students on speed, power, strength. According to the research "Physical Fitness across 11- to 17-Year-Old Adolescents: A Cross-Sectional Study in 2267 Austrian Middle- and High-School Students" (Greier et al, 2019), showed that weight change occurred in a similar pattern, which resulted in no significant differences in BMI across age groups in boys. In girls, linear growth appears to slow around the age of 13 with a plateau after 15 years of age. Weight followed a similar pattern, resulting in only minor differences in BMI across age groups. peed (20-m-Sprint). There was a significant sex-by-age interaction effect for sprint performance ($p < 0.01$). Even though boys and girls showed a significant improvement until the age of 13, boys continued to improve their sprinting performance, while girls displayed a plateau. Accordingly, there was no significant difference in sprinting performance between the ages of 13 and 17 in girls. 17-year-old boys, on the other hand, displayed significantly better sprinting performance compared to the age groups of 11 to 14 years ($p < 0.013$). Across the entire age range, boys displayed significantly better sprinting performance than girls.

Standing Long-Jump. There was a significant sex-by-age interaction effect in boys, performance improved significantly across age groups until the age of 15. In girls, the improvement was less pronounced and plateaued after the age of 15. Standing-long jump performance of 17-year-old girls was significantly better compared to 11- or 12-year-old girls. Across the entire age range, boys displayed significantly better jumping performance than girls. Push Ups. There was a significant improvement from the age of 12 to 13. After the age of 13, performance remained relatively constant in boys. Accordingly, 17-year-old boys performed a higher number of push-ups compared to 11- and 12-year-old boys. In girls, there was a slight decline in push-up performance after the age of 13, resulting in no significant differences between 17-year-old girls compared to the younger age groups. Across the entire sample, boys displayed significantly better performance than girls. Sit Ups. There was a significant increase for each age group between 11 and 13 years. After the age of 13, the improvement was less pronounced but 17-year-old boys performed significantly more sit-ups than 11- to 14-year-old boys. In girls, improvement across age groups was less pronounced and remained relatively stable after the age of 13. Due to a significant improvement from the age of 12 to 13, 17-year-old girls performed a higher number of repetitions than girls at the ages of 11 and 12. Across the entire age range, boys displayed significantly better performance than girls. Endurance (6-min-Run). There was a significant improvement from 11 to 12 years of age in girls. After the age of 12,





endurance performance remained relatively stable with a gradual decline after the age of 15. In boys, there was a gradual improvement in endurance performance from the age of 11 to the age of 17 with a significant improvement between the ages 14 and 15. Accordingly, 17-year-old boys displayed a better 6-minute-run performance than 11 to 14-year-old boys. Across the entire age range, endurance performance was significantly better in boys compared to girls. Agility (Sideways Jumping). There was a significant improvement in agility was observed between 11 and 13 years of age in boys and girls. Flexibility (Stand and Reach Test). There was a significant effect on flexibility between genders. Flexibility remained relatively constant in boys across the entire age range, while in girls there was an annual improvement in flexibility from the ages 11 to 13. After the age of 13 flexibility remained relatively stable and 17-year-old girls displayed better flexibility compared to girls at the age of 11 and 12. The improvement in flexibility in early adolescent girls also contributed to significantly better flexibility in girls compared to boys between 11 and 17 years of age.

The developed calisthenic exercise training program in this research did not aim to improve specific fitness, so it could not improve every fitness component, the place to do exercise was in the sports field not in the gymnasium so some types of exercise in the floor could not be done, and duration exercise was only 8 weeks, so these were the limitation of this training program. Some components of physical fitness need specific quality of frequency, intensity, time, and type of exercise to improve such as endurance, and weight control.

Conclusion

The calisthenic exercise could effectively improve physical fitness in primary school students. However, some components of physical fitness must select specific types or movements in calisthenic exercise to improve them.

Recommendation

In this study

1. Schools should provide calisthenic exercises for students to learn and practice because they could improve their physical fitness and carry over the value of lifelong exercise channels.
2. The teacher who implements the calisthenic exercise should consider the types or movements to cover the specific physical fitness components and select that movement in to exercise program.

In next studies

1. Propose to extend the research on calisthenic exercise by applying the Virtual exercise as assignments to do on daily physical exercise.
2. Selected calisthenic to design on rhythmic exercise for fun to motivate participation

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