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Development Program of Basic Physical Movement Skills for Early Childhood in Guangzhou City, China

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Abstract

Background and Aim: The data highlights the persistent issue of high obesity rates among young children, aged 3-6, despite economic development and improved living standards. The overall physical fitness of children in this age group is deemed suboptimal, impacting their health, learning efficiency, and social adaptability. Recognizing early childhood as a critical phase for physical and mental development, the General Office of the Central Committee of the Communist Party of China and the General Office of the State Council emphasize the importance of physical education in the compulsory education stage. The recommended teaching model involves imparting health knowledge and basic motor skills, with an evolving focus on specialized motor skills. The study aims to investigate means and curriculum arrangements for physical fitness and skill exercises, intervening in basic motor skills to promote a holistic approach to physical and mental development in young children, ultimately contributing to the sustainable advancement of physical education.

Materials and Methods: In this paper, using the methods of literature review, experimental method, expert interview method, observation method, and questionnaire survey method, an eight-week intervention experiment was carried out on 30, 5-6-year-old children, and the classroom teaching content was arranged in the way of physical fitness and basic motor skills integration.

Results: The results of the two-month intervention experiment were as follows: the development of physical fitness and basic motor skills was better than that of the pre-intervention experiment; in terms of physical fitness: boys improved better than girls in standing long jump, 10-metre run, and throwing a tennis ball; girls improved better than boys in flexibility; and the development of coordination and balance was comparable between boys and girls. Regarding basic motor skills: boys outperformed girls in mobility skills; girls outperformed boys in biomechanical skills.

Conclusion: In conclusion, the two-month intervention experiment exhibited positive overall outcomes in physical fitness and basic motor skills development, with distinct gender-specific variations. Boys showed superior progress in activities emphasizing strength and speed, while girls excelled in flexibility. Coordination and balance improvements were comparable between genders. The findings emphasize the importance of tailored approaches in physical education interventions to address diverse aspects of children's development.

Keywords: Physical Training; Basic Movement Skills; Physical Fitness; Early Childhood

Introduction

(1) Prominent physical health problems in young children: with the rapid development of the economy, the improvement of people's living standards, and lifestyle changes, the prevalence of obesity in young children remains high, and obesity has been recognized as a major chronic disease affecting the health and quality of life of modern human beings, especially in young children, the incidence of obesity has continued to rise has become a global public health problem that is of great concern to the

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medical community and nutritional sciences (Qin, Q. 2007). The National Bureau of Statistics (NBS) pointed out in its 2019 Statistical Monitoring Report on China's Child Development Programme (2011-2020) released in December 2020 that the number of children in pre-school education (including kindergartens and attached kindergarten classes) was 47.139 million. The prevalence rates of anaemia and low body weight among children under the age of 5 years were 5.38 percent and 1.37 percent, respectively, and the rate of growth retardation was 1.12 percent, slightly 0.01 percent higher than that of the previous year. the previous year was slightly higher by 0.01 percentage point, and the mortality rate of children aged 3-5 was 7.8 per thousand (Central People's Government of the People's Republic of China, 2020). The overall level of physical fitness of children aged 3-6 is not optimistic, with low rates of excellence and goodness, and nearly 1/5 of children failing the physical fitness test (Li, L., et al., 2020). Early childhood, as the foundation stage of physical and mental development, is the period in which it is most influenced by the passive environment, and is one of the most important stages in the development of young children's physical form, quality, functional development, intelligence, and emotion, as well as creativity and social adaptability. The level of physical fitness of young children is not only an indicator of their health but also an important factor affecting their learning efficiency, life, and social adaptability.

(2) The Ministry of Education's requirements for students to learn skills: the Opinions on Comprehensively Strengthening and Improving School Physical Education in the New Era, issued by the General Office of the Central Committee of the Communist Party of China and the General Office of the State Council on 15 October 2020, points out that physical education curricula at the compulsory education stage help students to master one or two motor skills and guide them to establish a correct concept of health. The school physical education teaching model of "health knowledge + basic motor skills + specialized motor skills" is gradually being perfected, with students being taught scientific exercise and health knowledge, and guided to master basic motor skills such as running, jumping, and throwing. While children aged 5-6 are in the sensitive period of basic motor development, the development and articulation of the reflexive and pre-adaptive periods are prerequisites for the successful mastery of basic motor skills (Gallahue & Donnelly, 2003). Learning and practicing fundamental motor skills at the EYFS, i.e., at 5-6 years of age, is then particularly crucial if one or two motor skills are to be mastered proficiently in compulsory education. By mastering a series of basic skills such as walking, running, jumping, climbing, spatial positional awareness, and control of the body's large muscles at an early age, children can lay a solid foundation for later complex movement, muscle development, and brain development, as well as contributing to children's social adaptation and the acquisition and mastery of specific skills. Gallahue, an American scholar, proposes that basic motor skills are the body's unnatural Basic Learnt Movement Patterns (Gallahue, & Ozmun, 2002) And (Logan, S.W., et al, 2018). Payne argues that children develop a variety of basic motor skills in the early to middle years (approximately 3-8 years of age) and that the foundation of these basic motor skills will allow children more choice in their motor responses and provide them with greater freedom of motor performance (Payne, G., 2008). These foundations of fundamental motor skills will allow children more choice in their motor responses and provide them with greater freedom of expression. Therefore, the developmental strengths and weaknesses of basic motor skills in early childhood are a popular topic of research.

(3) 5-6 years of age is a sensitive period for the development of children's basic motor skills:

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motor development occurs throughout the entire life process of human beings and is the result of their interaction with the environment and society. The level of motor development is closely related to human behavior, intelligence, and health. During childhood, movement development can be used to diagnose, evaluate, and monitor an individual's physical and mental development (Greg, P., 2008). Human movements are generally categorized into large muscle movements and fine movements. Macro muscular movements refer to the movements that are completed by the trunk, limbs, and other large muscle groups involved, which are closely linked to physical activities and are the main components of completing basic motor skills (Jia, B., 2015). Large muscle action is the foundation of movement development and the earliest motor skill developed in childhood. Early development of large muscle movements is not only conducive to the formation of correct basic motor skills and the improvement of physical activity level but also an important way for children to explore the environment, acquire knowledge of their surroundings, and improve their cognition (Li Jing, et al. 2013). According to the theory of movement development, childhood is a critical period for physical development and functional development, as well as a golden period for the development of basic motor skills (Li Jing, et al. 2019). Movement development experts believe that there is a "proficiency barrier" between the ages of 3-7 and 7-12, and that only by mastering multiple motor skills before the age of 7 can we break through this "barrier" and move on to the next stage (SEEFELDT, V. 1980). The "barrier" can only be broken through if multiple motor skills are mastered before the age of seven.) At the same time, American scholars put forward the model of "peaks of motor development", which describes the characteristics of human beings in different periods of the whole motor development (Jia, B., 2015). Among them, the basic movement pattern period is the key period for the emergence and development of basic motor skills. Children should master various basic movements and lay a good foundation for the formation of skilled movements during this period.3-6 years old is a sensitive period for children to develop their physical abilities and skills, and this period is crucial for their development. The most relevant of the child's perceptions of movement development is kinesthetic, which revolves around awareness of movement and body position. Basic motor awareness related to kinesthesia includes body awareness, spatial awareness, orientation awareness, vestibular awareness, and azimuthal awareness. These consciousnesses are inextricably linked and inseparable in most movements. According to the law of children's motor development, early childhood is a sensitive period and an important period of transition in all aspects of children's development, so it is very important to study the development of their basic motor skills and physical fitness during this period.

(4) The proposal of the theory of physical-technical integration and its advantages: Physical fitness (physical strength) is the fundamental ability of the human body to maintain its life characteristics and to engage in daily life. Insufficient time for physical training in early childhood, too little time for moderate to high-intensity physical activity, and too much static lifestyle can lead to various types of physical illnesses which are the main risk factors for chronic and heart diseases in later life (Ekelund, U., 2012). Physical training is not only an indicator of the effectiveness of an individual's exercise but also has a relationship with an individual's physical and mental health (Hallal, P.C., 2006). Adequate time for physical training not only brings positive effects on the physical and mental development of young children but also lays the prerequisite and foundation for a healthy lifestyle in later life. Basic motor skills and physical fitness are integrated throughout life, from basic walking, running, jumping, and crawling to complex rolling, turning, and flipping, and even picking up, pulling,

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pushing, or more complex jumping, all of which require the support of motor skills and the synergy of motor skill combinations (Biddle, S.J.H., & Pearson, N., 2010). It can be said that physical fitness is the basis for the development of motor skills, motor skills is the continuation of the development of physical fitness, the level of physical fitness affects the level of skills, the strength of motor skills can also reflect the level of physical fitness. In short, physical fitness and motor skills influence each other and promote each other, and the development of one side has a positive transfer effect on the other side.

On 25 October 2016, the Central Committee of the Communist Party of China and the State Council, by the strategic deployment of the Fifth Plenary Session of the 18th CPC Central Committee, formulated the Outline of the "Healthy China 2030" Plan to promote the construction of a healthy China and improve people's health. It points out that health education should be made an important part of quality education at all stages of education, with kindergartens, and primary and secondary schools as the focus, and a mechanism for promoting health education should be established, and a certain amount of exercise time or intensity should be guaranteed every day. In response to the major health problems and factors affecting the population at different stages, several priority areas have been identified, and means of intervention have been strengthened to achieve health services and protection from the fetus to the end of life, further reflecting the importance that the state attaches to the promotion and intervention of students' health (Outline of the "Healthy China 2030" Plan, 2010 (CPC Central Committee and State Council. 2016) The guiding documents for early childhood education point out the direction and give suggestions for early childhood education, and provide a policy guarantee for the standardized management of kindergartens, the teaching and learning of teachers, and the physical and mental development of young children, but how to implement or enforce them to achieve the desired results still needs to be further explored. Based on the above issues and from the perspective of movement development, what are the existing problems with the physical fitness test for young children? How can the existing problems of physical fitness of young children be further solved? How to improve their basic motor skills? Is it possible to combine physical fitness and skills in early childhood? What are the effects of physical training along with the learning and practice of basic motor skills (i.e., physical-skill integration)? How would the process be designed? These questions need to be explored further.

Objectives

1. Sorting out the theory of body-technique integration;
2. Selection of content and program of physical training interventions;
3. Selection of content and curriculum design for basic motor skills training interventions;
4. To test the effectiveness of the intervention based on a longitudinal comparison of pre-and post-test results in the experimental group, and to validate the constructed theory of body-skills integration;

Literature Review

Fundamental motor skills (FMS)

Fundamental movement skills (FMS) are the ability of an individual to perform certain basic movements in physical activities, and the future development of specialized movement skills is also dependent on the level of FMS. It can be divided into displacement skills (the ability to move spatially, including walking, running, jumping, etc.), object control skills (the ability to control some kind of

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apparatus, such as grasping, gripping, patting, etc.), and stabilization skills (the ability to maintain balance in some kind of environment, such as flipping, rotating, etc.) (Barnett L M, 2016). The "Peak Theory of Motor Skill Development" suggests that basic motor skills are formed between the ages of 1 and 7 years, transitioning to gradual application and proficiency between the ages of 7 and 12 years, and that childhood and adolescence a critical stage for laying the foundation and can influence the formation and development of motor skills, especially specialized skills, in adulthood. It has a positive effect on the improvement of the comprehensive physical quality of children and adolescents, the cultivation of sports habits, and the healthy development of psychology (Ma, R., & Song, H. 2017).

Nowadays, there are many basic motor skills testing methods in the international arena, each with its advantages, and they have been researched and tested in different geographical areas and at different age groups. The main tests are: Bruininks-Oseretsky Test of Motor Proficiency (BOT-MP), korperkoordinations test fur kinder (KTK), Movement Assessment Battery for Children (M-ABC), Gross Motor Development Test (GMDT), and the Bruininks-Oseretsky Test of Motor Proficiency (BOT-MP). Movement Assessment Battery for Children (M-ABC), Test of Motor Development (TGMD-2 and TGMD-3), The Preschooler Gross Motor Quality Scale (PGMQS), and the Gross Motor Quality Scale (GMQS). Gross Motor Quality Scale (PGMQ), the Australian Basic Motor Skills Assessment Tool (Get Skilled, Get Active, GSGA), and so on (Wu Shengkou, 2014). The Test of Gross Motor Development (TGMD) is mostly used in domestic research on basic motor skills for experimental design, It was first designed and implemented by Ulrich and updated to the third edition in 2013, and is one of the most influential basic motor skills scales in the international arena, and its reliability and validity have been examined by Li Xingying (Li, 2022) and others, who proved that it has been used in the basic motor skills of 3- to 12-year-old children in China. Li Xingying (Li Xingying, 2022) and others tested its reliability and validity and proved that it showed good applicability in the test of basic motor skills of children aged 3 to 12 in China, and could be used as an effective tool for the evaluation of children's basic motor skills development in China. Moreover, many empirical studies in China have proved that the TGMD-3 has had a lot of achievements in the localization of China.

Physical Cognitive Function

Physical cognition refers to the process by which people recognize and understand things or phenomena, and save the results of the cognition to solve practical problems by using relevant knowledge and experience (Li Yanwei, 2010), which is expressed as cognitive ability. After reviewing a large amount of literature related to physical training, basic motor skills, and functional training, it is concluded that scientific and systematic training of physical fitness and basic motor skills or specialized sports skills can effectively improve body cognitive function. More researchers chose different sports, different age stages, different training modes, and different experimental groups, which had different effects on the results. However, it can be seen in the study that sports have a significant effect on physical fitness and cognitive function, but the training effect varies with different training programs and different groups of subjects. The previous research provides a lot of information and basis for this thesis, which lays the foundation for better design of teaching content and training methods.

Among them, Aslynn Courtney Halvorson's cycling exercise intervention with children using the Stroux et al. test significantly increased children's accuracy with improved reaction times (Aslynn Courtney Halvorson, 2014). Yanfeng Li conducted a study on obese children aged 8-16 years old using the Numerical Memory Breadth, Attention, and memory, the study concluded that obese children who

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participated in less exercise had lower scores on the test than their normal peers (Li, Yanfeng, 2008), suggesting that exercise can improve cognitive functioning in children. Eric S. Drollette conducted cognitive assessments of impulse inhibition and reaction time with 8-10-year-olds, and the study showed that aerobic exercise can promote cognitive functioning (Drollette, et al. 2014). Drollette, et al. 2014). Zhang Lei found that exercise improves and enhances the development of attention in preschool children through exercise interventions (Zhang Lei 2015), which were tested using the Attention Allocation Lab Instrument and the Attention Focusing Lab Instrument. Wen Hongxiang found that tai chi exercise can improve distraction symptoms in children with ADHD (ADHD) by studying children with ADHD, using the Digital Breadth Cognitive Test (Wen Hongxiang, 2010). This shows that physical exercise can improve the development of children's cognitive function to a certain extent (Li Minggao, 2013). Studies on children and adolescents have found that long-term physical exercise based on physical function training can both improve some specific cognitive functions and promote the development of general cognitive abilities (Sun Yanlin, 2015).

Conceptual Framework

This research was designed as a conceptual framework as following

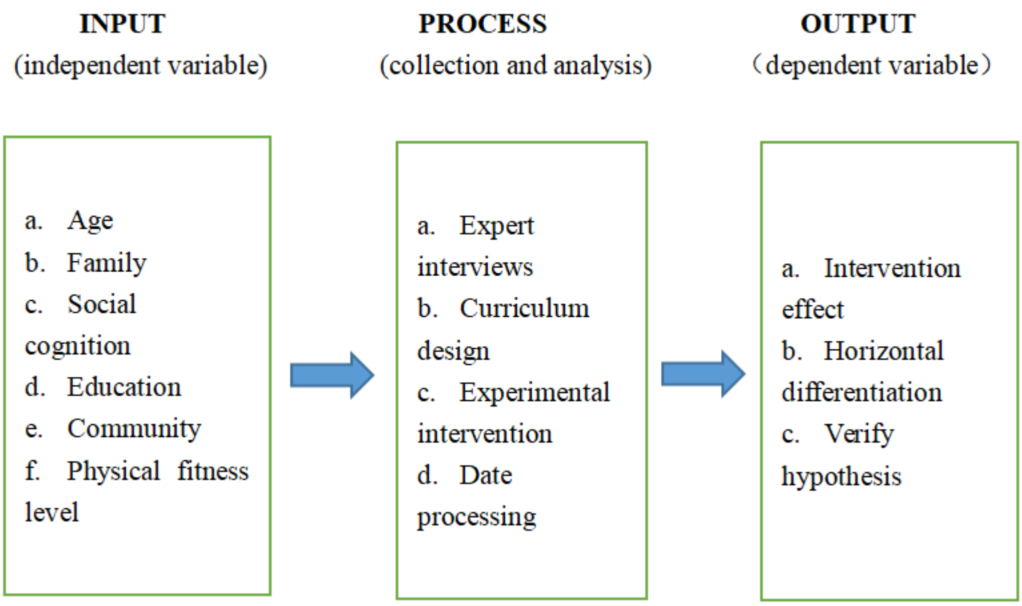

Figure 1 Conceptual Framework

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Methodology

Literature method

Through the Guangzhou Sports Institute and Guangzhou Municipal Library related books and materials, Web of Science, Scopus, Dimensions CNKI, and other data repositories, we review related literature and materials about children's physical fitness, children's physical fitness training and basic motor skills, large muscle movements, gross motor movements, and basic motor skills. Understand the current status of research at home and abroad, according to the needs of this study to collate relevant information to provide theoretical support for this paper.

Bibliometric methodology

Through bibliometrics, the collected literature will be visualized in the form of a knowledge graph, and combined with the data to interpret the research history, development status, hotspots, research trends, authors, and distribution of articles, etc., to more comprehensively and objectively understand, summarise and summaries the research results in this field, and serve as the theoretical basis of the present study.

Expert interview method

Through the interview method, we consulted experts from the Physical Fitness Training Centre of Guangzhou Sports Institute, professors in the field of school sports and social sports, teachers of kindergarten physical education courses as well and coaches of well-known physical fitness and skills training institutions in China, and discussed the setting of the contents of the physical fitness and skills courses for young children, course arrangements, intensity and measurement, etc., and explored the conditions for combining young children's basic motor skills and physical fitness, to finally determine the contents and course arrangements of the young children's fitness training and provide scientific guidance basis for the writing of this paper.

Observation

In the classroom always pay attention to the student's situation, such as movement completion, technical mastery, physical fatigue, etc.; the emergence of problems promptly; observe the normality of the students' movements in practice, such as the emergence of irrational force, irregular movements and other phenomena corrected promptly; to observe the students' psychological changes before and after the experimental changes in psychological and physical fitness.

Mathematical and statistical methods

The data obtained from the test were entered into Excel software, and then the data were processed using spss26.0, and analyzed according to the output results in conjunction with the actual situation. The data were found to be normally distributed; the independent samples t-test was used to compare the differences in gender indicators between and within groups, the paired samples t-test was used to compare the differences in indicators before and after the experiment within the group, and finally, the relationship between the level of development of basic motor skills and the level of physical development was analyzed using bivariate analysis.

Experimental methods

This study was conducted with 30 children from the Kindergarten on Sports Road West, Tianhe District, Guangzhou City, Guangdong Province, China, and the experimental group was (physical fitness and basic motor skills integration group). The content of the exercise intervention was based on the constraint model theory and combined with the physical and mental developmental characteristics

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of young children and was conducted in the form of a game, with an intervention period of 8 weeks, three exercise interventions per week, and each session lasted 45 minutes, and the content structure of the experimental group's program is shown in Table 5. The classroom was monitored and controlled by Huang Yirong's Evaluation of Intensity of Early Childhood Physical Activity Scale (Huang, et al. 2013), and the children's coloring was adjusted in real-time by the amount of sweating and the degree of fatigue, sweating, and fatigue level in real-time to adjust the amount of exercise and exercise intensity. In the experimental group, a series of exercise interventions were designed based on the content of basic movement skills and the content of the National Physical Fitness Test Standard (for young children), and by the principles of science, safety, comprehensive development, gradual progression, and fun under the constraint's theory of individual constraints, task constraints, environmental constraints, and goal-setting theory. The TGMD-2 and the National Standard for Physical Fitness of Students were used to test the proposed theory of physical-skill integration by examining the development of basic motor skills and students' physical fitness levels.

Table 1 Structure of the program in the experimental group

Program structure	Course content	Course Duration	Program Objectives
beginning	Dynamic stretching, warm-up exercises Jogging, small games, basic physical exercises	10min	Perform full-body activities to avoid sports injuries and get into work as soon as possible
fundamental part	Perform three to four station rotations (physical fitness or combined skill and fitness movement exercises)	30min	Completion of the main body of the lesson, to promote the acquisition and improvement of skills or physical abilities in young children
end	Summaries the process of the activity and perform stretching and relaxation exercises to a musical background	5min	The gradual change from a state of high excitement or tension to a state of relative relaxation.

Video analysis method

In the process of classroom testing, to more accurately quantify the students' movement completion, so in the process of testing the basic movement skills always keep a high-definition video camera in the front and the side of each, to test each child's basic movement skill recorded, and after the test use mobile phones or computers for each child's basic movement skills video for slow-motion replay, for scoring again, to ensure that data accuracy and scientific.

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Results

1. Results and comparative analyses of the development of physical fitness levels of 5-6-year-old children before and after the experiment

Table 2 Comparative analyses of the development of physical fitness levels of 5-6-year-old children before and after the experiment

	Group (mean ± standard deviation)			F	P-value
	1.0 (n=30)	2.0 (n=30)	3.0 (n=30)		
Standing long jump	93.967±11.938	106.867±13.001	114.533±11.988	21.357	0.000**
10M×2	8.195±0.660	7.648±0.774	7.233±0.730	13.336	0.000**
Sit-up-and-bend	10.573±3.352	13.734±4.099	15.533±4.665	11.393	0.000**
Balance beam	5.085±1.320	4.019±1.027	3.204±0.918	21.989	0.000**
Netball	5.757±1.008	7.223±0.991	7.730±1.097	29.511	0.000**
Jump on both feet continuously	6.745±1.026	5.628±1.189	4.942±1.233	18.687	0.000**

Note: * represents P < 0.05, ** represents P < 0.01; The three sets of data are the mean ± standard deviation values of the grades measured in the first, fourth, and eighth weeks of the experimental trials, respectively;

The sample levels of standing long jump, 10M×2, seated forward bending, balance beam walking, tennis ball throwing, and two-legged continuous jumping measured at the beginning, during, and after the experiment were all significant ($p<0.05$), implying that after eight weeks of experimental intervention in physical fitness and basic motor skills, the children's level of physical fitness was greatly improved, no matter whether it was from the pre-experimental and experimental (i.e. from the first week to the fourth week), during the experiment and after the experiment (i.e. from the fourth week to the eighth week) and even between the intervention effects of the pre-experimental and post-experimental tests (i.e. from the first week to the eighth week), all of them showed significant differences ($p<0.05$).

Analyzing the score levels of the physical fitness pre-test and post-test of young children of different genders

Table 3 Analyzing the score levels of the physical fitness pre-test and post-test of young children of different genders

	Group (mean ± standard deviation)		t	P-value
	1.0 (n=16)	2.0 (n=14)		
Standing long jump 1	93.938±12.102	94.000±12.203	-0.014	0.989
Standing long jump 2	108.000±14.792	105.571±11.008	0.504	0.618
Standing long jump 3	117.188±12.357	111.500±11.216	1.312	0.200
10M×2 1	8.069±0.663	8.338±0.651	-1.116	0.274

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	Group (mean ± standard deviation)		t	P-value
	1.0 (n=16)	2.0 (n=14)		
10M x 2 2	7.433±0.809	7.894±0.678	-1.680	0.104
10M x 2 3	6.994±0.703	7.506±0.685	-2.014	0.054
Seated Forward Bend 1	10.518±3.769	10.636±2.942	-0.095	0.925
Seated forward bends 2	12.120±4.034	15.464±3.527	-2.369	0.025*
Seated forward bends 3	13.325±4.012	18.057±4.136	-3.177	0.004**
Balance beam walk 1	4.990±1.116	5.193±1.559	-0.414	0.682
Balance beam walk 2	3.992±0.918	4.050±1.174	-0.152	0.880
Balance beam walk 3	3.127±0.810	3.291±1.052	-0.483	0.633
Tennis throw 1	5.862±1.171	5.636±0.810	0.608	0.548
Tennis Throw 2	7.331±1.196	7.100±0.714	0.631	0.533
Tennis Throw 3	8.012±1.321	7.407±0.681	1.543	0.134
Double leg jumps 1	6.724±1.044	6.770±1.044	-0.121	0.905
Jump 2 consecutively on both feet	5.664±1.113	5.587±1.312	0.174	0.863
Jump on both feet 3 times in a row	4.936±1.174	4.950±1.343	-0.031	0.975

Note: * represents P < 0.05 and ** represents P < 0.01;

Although there were significant changes in the physical fitness levels of the 30 children after the two-month intervention, there were differences in growth rates in each event between the genders of the children. From the beginning of the intervention, when boys and girls had comparable levels of physical fitness, to the post-intervention period, boys showed better growth than girls in the standing long jump, 10-meter sprint, and tennis ball throw, and less growth than girls in the level of flexibility symbolized by seated forward bending, while boys and girls had comparable results in the balance beam walking and two-legged continuous jumping, with no significant differences. As shown in Table, after eight weeks of physical skills integration training, there was a certain degree of improvement in the physical fitness of children aged 5-6 years, but except for seated forward bends, which showed a significant difference in the second test, and a highly significant difference in the third test, the other physical fitness items were not significant in terms of gender. From the perspective of the physical and mental development of young children and the perspective of exercise physiology, boys have priority over girls in the development of certain aspects of motor qualities, and there is a certain difference in the sensitive period for the development of some qualities of boys and girls, which is why the experiment showed an increase in the scores of all the items after the eight-week intervention, but there was a certain difference in the magnitude of the increase of different genders.

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Test results and comparative analyses of the development of basic motor skill levels of 5-6-year-olds before and after the experiment

Comparison of the basic motor skills test scores before, during, and after the experiment (i.e., Week 1, Week 4 & Week 8 of the intervention) yielded the Table as shown below:

Table 4 Comparative analyses of the development of basic motor skill levels of 5-6-year-olds before and after the experiment

	Group (mean ± standard deviation)			**F**	**P-value**
	1.0 (n=30)	**2.0 (n=30)**	**3.0 (n=30)**		
leak or evaporate	4.233±0.774	4.300±0.915	4.867±0.819	5.171	0.008**
standing long jump	4.467±1.167	4.500±0.974	5.733±1.048	13.762	0.000**
jump on one leg	4.067±1.048	4.167±1.177	5.067±1.337	6.390	0.003**
forward straddle jump	3.133±0.819	3.400±0.770	4.433±0.971	19.218	0.000**
forward sliding step	4.000±1.365	4.200±0.997	5.100±0.995	8.037	0.001**
sidestep (in dance)	5.433±1.547	5.633±1.159	6.500±0.974	6.177	0.003**
shot put (golf)	4.667±0.547	5.100±0.305	6.133±0.937	40.233	0.000**
kicker	4.933±0.691	5.133±0.507	6.100±0.662	29.852	0.000**
double-handed catch	3.600±0.563	3.933±0.365	4.900±0.481	60.201	0.000**
spike	3.467±0.507	3.733±0.450	4.467±0.571	30.696	0.000**
overhand pitch	3.233±0.626	3.767±0.568	4.900±0.712	53.362	0.000**
Rollerball (sport)	3.400±0.621	4.067±0.640	5.067±0.828	42.780	0.000**

In conclusion, the samples of different groups showed significant differences in running, standing long jump, one-legged jump, front step, front slide, side slide, in-situ ball shooting, kicking, catching the ball with both hands, hitting the stationary ball, overhand throwing, and ground ball rolling. Therefore, the integration of physical fitness and skill training can better promote the development of students' basic motor skills.

Analyses of scores on the pre-test and post-test of basic motor skills of young children of different genders

Table 5 Analyses of scores on the pre-test and post-test of basic motor skills of young children of

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different genders

	Group (mean ± standard deviation)		t	P-value
	1.0 (n=16)	2.0 (n=14)		
Run 1	4.250±0.856	4.214±0.699	0.124	0.902
Run 2	4.063±1.063	4.571±0.646	-1.556	0.131
Run 3	4.875±0.957	4.857±0.663	0.059	0.954
Standing long jump 1	4.500±1.095	4.429±1.284	0.164	0.871
Standing long jump 2	4.625±0.885	4.357±1.082	0.746	0.462
Standing long jump 3	5.875±0.957	5.571±1.158	0.786	0.438
Single-legged jump 1	4.063±1.181	4.071±0.917	-0.023	0.982
Jumping on one foot 2	4.313±1.352	4.000±0.961	0.720	0.478
Jumping on one foot 3	5.188±1.328	4.929±1.385	0.522	0.606
Front straddle jump 1	3.125±0.719	3.143±0.949	-0.059	0.954
Front straddle jump 2	3.500±0.516	3.286±0.994	0.725	0.477
Front straddle jump 3	4.563±0.892	4.286±1.069	0.773	0.446
Forward Slide 1	4.000±1.155	4.000±1.617	0.000	1.000
Forward Slide 2	4.313±0.704	4.071±1.269	0.654	0.518
Forward Slide 3	5.250±0.856	4.929±1.141	0.879	0.387
Side Slide 1	5.438±1.315	5.429±1.828	0.016	0.988
Side Slide 2	5.688±1.014	5.571±1.342	0.269	0.790
Side Slide 3	6.563±0.892	6.429±1.089	0.370	0.714
Total Test Score 1	25.438±3.614	25.286±4.340	0.105	0.917
Total Test Score 3	32.250±1.983	31.000±3.637	1.145	0.266

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	Group (mean ± standard deviation)		t	P-value
	1.0 (n=16)	2.0 (n=14)		
In-situ shot 1	4.750±0.577	4.571±0.514	0.889	0.381
In-situ ball shot 2	5.188±0.403	5.000±0.000	1.861	0.083
In-situ ball shot 3	6.125±1.025	6.143±0.864	-0.051	0.960
Kick 1	4.938±0.772	4.929±0.616	0.035	0.973
Kickball 2	5.250±0.577	5.000±0.392	1.401	0.173
Kick 3	6.188±0.655	6.000±0.679	0.769	0.448
Catch the ball with both hands 1	3.688±0.479	3.500±0.650	0.907	0.372
Two-handed catch 2	3.938±0.443	3.929±0.267	0.066	0.948
Two-handed catch 3	4.938±0.574	4.857±0.363	0.451	0.656
Hitting fixed ball 1	3.438±0.512	3.500±0.519	-0.331	0.743
Hitting a fixed ball 2	3.813±0.403	3.643±0.497	1.032	0.311
Hitting a fixed ball 3	4.438±0.512	4.500±0.650	-0.294	0.771
Overhand Pitch 1	3.313±0.704	3.143±0.535	0.735	0.469
Overhand Pitch 2	3.938±0.574	3.571±0.514	1.830	0.078
Overhand Pitch 3	4.938±0.854	4.857±0.535	0.304	0.764
Ground Ball 1	3.438±0.629	3.357±0.633	0.348	0.730
Rollerball 2	4.250±0.447	3.857±0.770	1.735	0.094
Rollerball 3	5.250±0.775	4.857±0.864	1.313	0.200
Total Test Score 1	23.688±1.401	23.000±1.038	1.508	0.143
Total Test Score 3	31.750±2.145	31.214±1.578	0.769	0.448

Note: * indicates significant correlation at 0.05 level, ** indicates significant correlation at 0.01 level.

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The scores of basic motor skills measured three times by students of different genders were analyzed to produce a Table, from which it can be seen that: the scores of the children of different genders in each item of basic motor skills improved and progressed in the first week, fourth week and eighth week of the experiment, but the difference in genders didn't result in the significance of the results. There was no significant difference (p>0.05) in the scores of running, standing long jump, one-legged jump, ground ball, two-handed catch, hitting the ball, straddle jump, front slide, side slide, ball slap, overhand throw, kicking, total body displacement, and total object control.

Correlation study between the level of development of basic motor skills and the level of physical fitness development

Table 6 Correlation study between the level of development of basic motor skills and the level of physical fitness development

	Standing long jump	M2	Sit-up-and-bend (physical exercise)	Balance beam (gymnastics)	Netball	Jump on both feet continuously
Leak or evaporate	0.067	-0.020	-0.014	0.044*	0.067	-0.151
Standing long jump	0.004**	0.005**	-0.317	0.048*	-0.130	0.005**
Jump on one leg	0.022*	0.043*	-0.136	0.160	0.004**	0.004**
Forward straddle jump	0.038*	0.007**	-0.085	0.028*	0.196	0.031*
Forward sliding step	0.038*	-0.099	0.048*	0.027*	0.015*	-0.153
Sidestep (in dance)	0.043*	0.002*	-0.146	-0.371	0.057	0.008**
Shot put (golf)	0.263	0.164	0.013*	-0.144	0.035*	0.300
Kicker	-0.127	0.012*	0.070	0.047*	-0.184	0.039*
Double-handed catch	-0.084	0.102	0.087	0.223	0.228	-0.442
Spike	0.082	-0.215	0.031*	0.179	0.034*	-0.194
Overhand pitch	0.032*	0.011*	-0.034	-0.024	0.009**	0.028*
Rollerball (sport)	-0.002	0.061	-0.026	-0.052	0.415	0.434

Note: * indicates significant correlation at the 0.05 level, ** indicates significant correlation at the 0.01 level;

As can be seen from Table 16, the performance of standing long jump in the physical training has a very significant correlation with the standing long jump in the basic movement skills (p<0.01), and has a significant correlation with one-legged jump, front straddle jump, front glide, side glide, and overhand throw (p<0.05), and has a negative correlation with kicking, two-handed catching, and ground ball; the 10M×2 round-trip run has a very significant correlation with the standing long jump, front straddle jump The 10M×2 round trip run was very significantly correlated with the standing long jump, front straddle jump (p<0.01), and significantly correlated with the one-legged hop, side step, kicking ball, and overhand throwing (p<0.05), and negatively correlated with the running, front straddle step, and hitting the stationary ball; the seated body flexion was significantly correlated with the front straddle step, in situ ball slap, and hitting the stationary ball (p<0.05), and was negatively correlated with the running, standing long jump, front straddle jump, one-legged hop, side step, and overhand throwing, ground ball; whereas balance beam walking showed significant correlation with running, standing long jump, forward skipping, forward straddle jump, kicking the ball (p < 0.05), and negative correlation

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with side skipping, in-situ ball shooting, overhand throwing, and ground ball; and tennis ball throwing showed very significant correlation with single-leg skipping, overhand throwing ($p < 0.01$), and significant correlation with forward skipping, in-situ ball shooting, and hitting the stationary ball ($p < 0.05$), and standing long jump and kicking the ball showed negative correlation; two-legged continuous jumping had a very significant correlation with standing long jump, one-legged jump, and side-sliding step ($p<0.01$), and a significant correlation with front straddle jump, kicking the ball, and overhand throwing the ball ($p<0.05$), and a negative correlation with running, front-sliding step, two-handed catching the ball, and hitting a stationary ball.

Conclusions

This paper confirms through experimental interventions and test analyses that the integration of physical fitness and basic motor skills training can effectively improve the physical fitness and motor skill levels of 5-6-year-old children; it also confirms that the theory of physical-skill integration is very meaningful and valuable.

Based on the basic movement stage of the "pyramid" model, the basic movement pattern stage of the "movement development peak" model, and the content of physical fitness and basic motor skills in the "Compulsory Education Physical Education and Health Curriculum Standard", and combined with the physical and mental development characteristics of young children, the content of physical fitness training was designed to improve the physical fitness and basic motor skills of 5-6-year-old children. The content of physical fitness training is designed based on the theory of constraints, the theory of the formation of motor skills, and the theory of goal setting as the theoretical basis of the training content, which has a very significant effect on the promotion of the physical fitness and basic motor skills of children aged 5-6 years old.

The differences in the physical fitness development level of 5-6-year-old children are related to gender to a certain extent, specifically manifested in the fact that boys are better than girls in terms of strength, speed, and upper limb strength qualities, while lower limb flexibility is slightly inferior to that of girls, and the development levels of the two items of two-legged continuous jumping and walking on the balance beam are comparable.

There is no gender difference in the level of development of basic motor skills among children aged 5-6, and the level of development of displacement skills and object control is comparable. However, the increase in most of the indicators of basic motor skills in the eight-week training period for boys was greater than that for girls, and the increase in girls' performance was slightly better than that of boys in the areas of in-situ ball slapping and hitting a stationary ball.

There is a correlation between the level of basic motor skill development and the level of physical fitness development of 5-6-year-olds, with an overall moderate to high correlation.

Recommendations

The findings of this paper prove that the integration of physical fitness and basic motor skills training has a better promotion effect on children's physical and mental development. Therefore, school education and family education should fully recognize the importance of this concept, avoid the phenomenon of "emphasizing intelligence over physicality", and enhance the understanding of the value of physical-skill integration.

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The integration of physical and technical training is in line with the physical and mental development of children aged 5-6 years old, which not only focuses on and combines the factors of children's healthy growth and development, but also matches the sensitive period of the development of basic motor skills and physical ability, and can meet the needs of children's comprehensive development. Therefore, it is recommended that physical education programs in schools integrate physical skills training.

The integration of physical skills training follows the developmental requirements of the new curriculum and has a positive impact on the improvement of children's physical fitness and the mastery of motor skills. However, is there a delayed effect, and what kind of positive transfer effect is there? It is not yet known. Therefore, it is necessary to follow up on the study to investigate the sustained effects of physical skills integration training on children's physical fitness and specialized motor skills.

As a comprehensive intervention program, physical skills integration training may also have an impact on children's sensory integration, stability of vestibular function, executive function, and cognitive ability, and it is recommended that further research be conducted to investigate the impact on other aspects of children's performance in the future.

The experimental intervention in this paper lasted for two months, and due to the short intervention period, some classroom control details may be overlooked, which may have a certain impact on the monitoring of the training, measurement of the data as well as the acquisition of the data and errors. Therefore, in future studies, it is recommended to increase the intervention time to explore the effects of changes in the duration of exercise intervention on the development of physical fitness and basic motor skills.

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