THE EFFECT OF CUSTOMIZED FITNESS PROGRAM ON CHILDREN AGED 3-6 YEARS OLD

JIANG WEN MING

SULTAN IDRIS EDUCATION UNIVERSITY

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ABSTRACT

The level of development of motor skills in children aged 3-6 years has a significant impact on their lifelong level of physical fitness. The purpose of this study was to establish a holistic model of physical fitness development in children aged 3-6 years old and to evaluate the effect of a customized physical fitness intervention plan based on this model. Systematic review and meta-analysis were used to determine current weaknesses in fundamental skills intervention program, which validated the model used 【Children Sports Ability Training (CSAT) Model】. The customized fitness program based on the model were then used by a total of 545 children aged 3-6 years old in an early childhood fitness centre in Chengdu, China as part of their curriculum. During the period, motor skills were assessed at pre and post using Peabody Developmental Motor Scale-2 (PDMS-2). The meta-analysis result showed that 92% intervention program only utilized gross motor skills from 2013-2023. Profiling assessment result show that children aged 3-6 years had moderate to low levels of overall motor skill development, and that the developmental levels of the five categories of gross and fine motor skills, among which the worst developed is object manipulation. It was also found that there is a difference in the development of five types of motor skills in three age groups of children aged 3-6 years. Five types of motor skills were found that correlated with each other with moderate to high strength. Finally, this customized fitness intervention program was found to have a significant difference in the development of motor skills among 3-6 years old in a pre-test and post-test, and it showed differences in the facilitation of different categories of motor skills in three age groups. In conclusion, the CSAT and its corresponding curriculum can be said to be able to promote motor skill development in children aged 3-6 years old. The results provide holistic concepts and program for trainers and teachers that involves with children's physical development. Further research is needed to continually improve the differentiated design of the CSAT for different age groups.

Keywords: Children Sports Ability Training, Motor Skills, Gross Motor Skills, Fine Motor Skills.

KESAN PROGRAM KECERGASAN KHAS TERSUAI TERHADAP KANAK-KANAK BERUMUR 3-6 TAHUN

ABSTRAK

Tahap perkembangan kemahiran motor kanak-kanak berumur 3-6 tahun memberi kesan yang besar terhadap tahap kecergasan fizikal mereka sepanjang hayat. Tujuan kajian ini adalah untuk mewujudkan model holistik perkembangan kecergasan fizikal dalam kalangan kanak-kanak berumur 3-6 tahun dan menilai kesan pelan intervensi kecergasan fizikal yang disesuaikan berdasarkan model ini. Kajian sistematik dan meta-analisis digunakan untuk menentukan kelemahan semasa dalam program intervensi kemahiran asas, yang mengesahkan model yang digunakan *[Model Latihan Keupayaan Sukan Kanak-kanak (CSAT)]*. Program kecergasan tersuai berdasarkan model itu kemudiannya digunakan oleh sejumlah 545 kanak-kanak berumur 3-6 tahun di pusat kecergasan awal kanak-kanak di Chengdu, China sebagai sebahagian daripada kurikulum mereka. Dalam tempoh tersebut, kemahiran motor asas dinilai pada kesan pra dan pasca menggunakan *Peabody Developmental Motor Scale-2 (PDMS-2)*. Hasil meta-analisis menunjukkan bahawa *92%* program intervensi hanya menggunakan kemahiran motor kasar dari *2013-2023*. Keputusan penilaian pemprofilan menunjukkan bahawa kanak-kanak berumur 3-6 tahun mempunyai tahap pembangunan kemahiran motor keseluruhan yang sederhana hingga rendah, dan tahap perkembangan lima kategori kemahiran motor kasar dan halus, di antaranya yang paling teruk berkembang ialah manipulasi objek. Didapati juga terdapat perbezaan perkembangan lima jenis kemahiran motor dalam tiga kumpulan umur kanak-kanak berumur 3-6 tahun. Lima jenis kemahiran motor didapati berkorelasi antara satu sama lain dengan kekuatan sederhana hingga tinggi. Akhirnya, program intervensi kecergasan tersuai ini didapati mempunyai perbezaan yang signifikan dalam pembangunan kemahiran motor dalam kalangan 3-6 tahun dalam ujian pra dan ujian pasca, dan ia menunjukkan perbezaan dalam pemudahcaraan kategori kemahiran motor yang berbeza dalam tiga kumpulan umur. Kesimpulannya, *CSAT* dan kurikulum yang sepadan dengannya boleh dikatakan mampu menggalakkan perkembangan kemahiran motor kanak-kanak berumur 3-6 tahun. Hasilnya menyediakan konsep dan program holistik untuk jurulatih dan guru yang melibatkan perkembangan fizikal kanak-kanak. Penyelidikan lanjut diperlukan untuk terus menambah baik reka bentuk terbeza *CSAT* untuk kumpulan umur yang berbeza.

Kata Kunci: *Children Sports Ability Training*, Kemahiran Motor, Kemahiran Motor kasar, Kemahiran Motor Halus.

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LIST OF ABBREVIATIONS

BA	Biological Age
BH	Body Height
BOT-2	Bruininks-Oseretsky Test of Motor Proficiency-2
BW	Body Weight
DQ	Development Quotient
FMS	Fundamental Motor Skills
G	Grasping
GBA	Grasping Biological Age
GDQ	Grasping Development Quotien
GRS	Grasping Raw Score
GSS	Grasping Standard Score
HMD	Human Motor Development
LM	Locomotion
LMBA	Locomotion Biological Age
LMDQ	Locomotion, Development Quotient
LMSS	Locomotion Standard Score
LPRS	Locomotion Raw Score
LTAD	Long-term athlete development
MA	Month Age
MS	Motor Skills
OM	Object Manipulation
OMBA	Object manipulation Biological Age

OMDQ	Object manipulation Development Quotient
OMRS	Object manipulation Raw Score
OMSS	Object manipulation Standard Score
PDMS-2	Peabody Developmental Motor Scale-2
RS	Raw Score
SP	Stationary performances
SPBA	Stationary performances Biological Age
SPDQ	Stationary performances Development Quotient
SPRS	Stationary performances Raw Score
SPSS	Stationary performances Standard Score
SS	Standard Score
TGMD-2	Test of Gross Motor Development-2
TGMD-3	Test of Gross Motor Development-3
VM	Visual-Motor integration
VMBA	Visual-motor integration Biological Age
VMDQ	Visual-motor integration Development Quotient
VMRS	Visual-motor integration Raw Score
VMSS	Visual-motor integration Standard Score)
YPD	The Youth Physical Development Model

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Physical activity plays a vital role in the overall development of children, especially in the early years. Participating in an organized fitness program not only promotes healthy growth, but also improves children's motor skills and coordination in all areas. The purpose of this study was to investigate the effects of a customized, specialized fitness program on the motor skills of 3 to 6 years old children.

During early childhood, children undergo significant physical, cognitive, and social changes, making it an ideal time to lay the foundation for lifelong healthy habits. Motor skills involve muscle movement and coordination and are an important part of child development. These motor skills can be categorized into gross motor skills, which involve larger muscle groups used for activities such as running and jumping, and fine motor skills, which involve smaller muscle groups used for tasks such as grasping and writing. Good development of children's motor skills during the 3-6 years old period is conducive to healthy physical growth, healthy psychological development, promotion of children's cognitive and learning abilities, as well as the development of good social adaptability and lifelong motor habits.

Previous research has shown that physical training and structured motor interventions have a positive impact on the development of children's motor skills. However, there has been limited research on the effect of long-term, specialized fitness programs that specifically address the needs of 3-6 years old children. There is a plethora of research addressing the current status and effect of interventions for gross motor skills in children aged 3-6 years old, but there is a dearth of research addressing the current status and effect of interventions for fine skills in children aged 3-6 years old children. There are many studies of short-term (4 weeks-30 weeks) intervention effects on gross motor skills in children aged 3-6 years old, but few studies of long-term intervention effects. There are very few in-depth studies

exploring the correlations between various types of gross motor skills and various types of fine motor skills in 3-6 years old children. This study aims to fill this gap by designing and implementing a customized long-term specialized fitness program that explores the correlations between various types of motor skills based on an understanding of the developmental level of motor skill competence in 3-6 years old children in Chengdu, Sichuan Province, China, and analyzes the key components of a specialized long-term fitness program that is effective in improving motor skill competence in this particular age group.

This study is a quantitative study, using experimental research methodology and the PDMS-2 (PEBODY DEVELOPMENT MOTOR SCAL-2) as a motor skill assessment tool for children aged 3-6 years old, to analyze the developmental level of motor skills of children aged 3-6 years old in Chengdu City, Sichuan Province, China, and to explore the current status of motor skill development, gross motor skills (stationary performances, locomotion, object manipulation) and fine motor skills (grasping, visual-motor integration) of children aged 3-6 years old, as well as the correlation between gross motor skills development and fine motor skills, and to verify the effect of changes in children's gross and fine motor skills after the implementation of a specific long-term intervention program. This study aims to contribute to the existing literature on early childhood development and can contribute to the early literature's paucity of research on the current state of fine

motor skill competency development in 3-6 years old children, the relatively few studies on the correlation between gross and fine motor skills, and the relatively few studies on the effects of long-term interventions. It also provides an in-depth analysis of the elements of a customized long-term fitness program for 3-6 years old children. The results of this study may provide very valuable insights and references for parents, teachers, and educators to design effective comprehensive and practical fitness programs for young children.

1.2 Background of the Study

The way of life of humans has changed dramatically as society and times have progressed, and society have transitioned from the industrial age of the twentieth century to the information age of the twenty-first century. The information era has revolutionized the way of acquire knowledge, skills, and information, as well as the way individuals work, live, and study. Because of this shift, the great majority of individuals spend much less time engaging in physical activity each day, significantly more time engaging in sedentary activities, and very little physical movement in everyday physical activities, a phenomena that is also frequent in children's growth and development.

Children's growing and learning environments in the information age differ greatly from those in the industrial and pre-industrial eras. Especially for city children. Children are born in high-rise buildings, and elevators, escalators, autos, and vehicles replace the majority of the steps and physical activities required for growth and development. The children enjoy a variety of activities, including pursuit, PC puzzle toys, mobile games, and iPad animation. The majority of children's learning processes occur while they are seated. Kindergarten, primary school, junior high school, and high school students' growth and learning demands are constantly extended as they listen, hear, read, and write (Wang, 2018).

According to a survey, kindergarten students sit for 6 hours while doing less than 2 hours of activity, while primary, middle, and high school students, particularly junior high school students, sit for 13 hours per day. There is a major lack of practice and practice of physical movement for the development of bones, muscles, and joints, and for growing youngsters, this physical activity time is seriously inadequate (Wang, 2018).

The World Health Organization highlights that physical activity (PA) has a favorable impact in lowering non-infectious diseases such as cardiovascular disease, cancer, diabetes, and chronic respiratory diseases. As a result, contemporary children's health is declining, and obesity and myopia are on the rise (WHO, 2019;

WHO,2020). Sub-health diseases and special diseases are becoming more and more common.

By conducting an analysis of trainees from a sports institution, among the nearly 5,000 students who came to register to participate in sports ability training. In every 100 children coming to consult. There were nearly 10 children with special diseases (special diseases including autism, hyperactivity, violence, developmental delay, mild cerebral palsy, etc.). Abnormal body posture (e. g. X / O type legs, scoliosis, round-shoulder hunchback, pelvis forward, etc.) exist in almost every child (Zhang, 2009). Physical coordination, physical stability, and basic movement skills are generally weak. Children's risk of falls during exercise. The risk of injury is generally too high(Zhang, 2009).

The decrease in children's health is most strongly related to daily physical activity and exercise time. China has implemented policies. To increase the overall health level's minimal daily exercise requirements, low and medium intensity exercise should be at least 150 minutes per week, and high intensity exercise should be at least 75 minutes. Exercise for one hour per day to achieve the goals set by pupils (Huang, 2010; Wang, 2013; Huang, 2010). However, this period is insufficient for children aged 3-6 years old who are growing and developing rapidly.

Children aged 3-6 years old are in the delicate period of sports system development, as well as the rapid development stage for gross and fine motor abilities.Children aged 3-6 have well-developed fine motor abilities due to their intellectual lifestyle, learning style, and entertainment style. However, the development of gross motor abilities in children aged 3-6 is severely hampered by the information age's learning, life, and entertainment techniques. Many researchers have advocated that the daily activity duration of young children is at least 3 hours (Guan, 2020), but the Hong Kong team is quite hazy regarding the sports content, sports style, and guidance style (Guan, 2020).

According to the Healthy China 2030 plan, the healthy development of human beings runs throughout the entire life cycle, and early infancy is the early stage of human healthy development, as well as an important and critical period to nurture healthy behaviors and exercise habits (Feng , 2003). Gross motor skills, as a medium of physical activity and exercise practice, contribute to children's physical growth and development, social communication, and growth learning. Children learn body motions via practice, learn body parts, maintain proper posture, enhance physical quality, and increase their survival chances. As a result, the development of action skills, particularly fundamental motor skills, is important to children's healthy development.

Good development and acquisition of motor skills have a very important impact on children's physical form, physical quality, physical function development, physical quality of physical quality growth, physical skills acquisition, as well as the enhancement of psychological cognitive level, good development of personality and behavior and the promotion of social adaptation. From this point of view, the development of rough action directly affects the health level of children (Li Jing, 2019), and the future health level, including but not limited to the posture, strength quality, speed quality, cardiopulmonary function; the mastery of fundamental motor skills is an important basis for the future of mastering special sports skills (Xiaopeng, 2020; Jing, 2019).

The competence level of motor skills of 3-6 years old affects the motivation of children aged 3-6 years old to participate in physical activity, and consequently their physical fitness, and is a key factor in the failure of Chinese children to develop lifelong exercise habits in the future. It has been found that children with lower motor skills participate in fewer physical activities and have significantly poorer physical fitness (Guan, 2020).

The frequency and duration of basic movement practice is an important factor in predicting the level of physical activity in preschool children (Wang, 2018). Currently, most kindergartens in China use physical education programs that can

improve preschool children's physical fitness levels. However, due to excessive family, school, and societal protection of 3-6 years old and exercise restrictions, only 3% of the average daily physical activity of children aged 3-6 years old reaches moderate-intensity (MPA) to moderate-vigorous-intensity (MVPA) (Bull et al., 2020).

There is a great deal of research related to motor skills in young children aged 3-6 years old because motor skills are the basic abilities of individuals to interact with their environment and perform a variety of physical tasks. They involve the coordination of muscles, nerves, and the brain to accomplish specific movements, whether fine or gross motor skills (Glauber, 2016). The importance of motor skills cannot be overemphasized as they play a vital role in our daily lives and overall development. The age of 3-6 years old is a critical period for the development of motor skills in young children (Hu, 2018). At this age, children establish connections to the outside world through the development of motor skills, and through the development of movement, they contribute to the enhancement of their cognitive level (Anna, 2022).

Development of motor skills in young children aged 3-6 years old is also an important relationship between the level of motor skill development and the development of children's perceptual ability (Nan, 2019). Studies have shown that

the better the development of motor skills, the better the development of children's perceptual ability, and the training of motor skills is the main way to improve children's sensory integration ability (Nan, 2019). The development of children's motor skills is inextricably linked to children's body weight, body composition, and sedentary time.The Study by (Huotari, 2018) showed that children with good motor skills are less likely to be obese and myopic.

The development of motor skills and the level of physical activity in children are strongly and positively correlated with their mental health (Matteo, 2020; Cristiana, 2020). In the United States, Australia, United Kingdom, Spain, New Zealand, China and other countries, there are studies on the current situation of motor skill development of children aged 3-6 years, which shows that motor skills of children aged 3-6 years play a vital role in the overall development of human life.

As a result, it is critical to explain the current state and relevance of motor skill development in China, as well as to create awareness among families, schools, and society about the development of motor skills in 3- and 6-year-olds. At the same time, given the current circumstances, it is critical to investigate and design a unique model of motor curriculum and targeted fitness intervention programs that can effectively support the development of motor skills in 3- and 6-year-old children.

1.3 Problem Statement

Many studies found that scholars focused on observing the developmental level of children aged 3-6 years old gross motor skills in their research . Numerous studies have pointed out that the development of control manipulation skills in children aged 3-6 years old is weaker compared to Locomotion skills (Coppens et al., 2021). Although there are many studies on the developmental level of gross motor skills, most of them are limited to locomotion and object manipulation motor skills, and there is a lack of research on the stationary performance skills of gross motor skills. There are relatively few studies on the developmental level of fine motor skills of children aged 3-6 years old.

There are many studies on the methods and effects of interventions on gross motor skills in children aged 3-6 years old, but most of them are focus on the effects of short-term motor program interventions. The majority of the interventions were designed to be short-term, 4-16 week motor programs centered on the gross motor skills of mobility and manipulative skills. They study by (Costello & Warne, 2020) shows that a 4-week fundamental motor skills intervention of two 30-minute sessions per week significantly increased fundamental motor skills proficiency in children aged 8-10 years old males and females. The current review found that the longest period of research on the impact of interventions on children's motor skills is 30

weeks. The study ((Bardid et al., 2017) shows that a 30-week fundamental motor skills intervention program can effectively improve the motor skills level of ordinary healthy in children. There is a lack of long-term, comprehensive motor skill enhancement programs designed to address the development of motor skills in 3- to 6-year-olds.

Among the studies on the current status of motor skill development in 3-6 years old, there is no comprehensive research on the correlation between the three types of gross motor skills (stationary performance, locomotion, object manipulation skills) and the two types of fine motor skills (grasping, visual-motor integration) in China.

Due to the lack of comprehensive research on the development of motor skills in children aged 3-6 years old and the correlation between the various types of motor skills, the elements of the numerous motor skills intervention research programs consisted mainly of locomotion skills and object manipulation skills (Palmer et al., 2019; Duncan et al., 2018; Trost & Brookes, 2021) etc. There is a lack of a clear elemental model for a comprehensive motor skill development program, as well as a design logic for a long-term motor skill development program.

In summary, this study will complement the research on the developmental level of comprehensive motor skills of children aged 3-6 years old in China, and effectively complement the research on the correlation of various types of motor skills. Based on the understanding of the developmental level of motor skills and correlation of motor skills of children aged 3-6 years old, this study will validate the effect of a specific long-term motor program to promote the development of motor skills among children aged 3-6 years old, and thus analyze the elements of a motor program and the design model of a long-term motor skill development program for promoting motor skill development of children aged 3-6 years old.

1.4 Purpose of the Study

The purpose of this study was to explore the effects of a customized physical fitness program on the development of motor skills in 3- to 6-year-old children. Providing a comprehensive list of components that should be included in a physical fitness intervention and motor skills intervention program for 3-6 year old children will provide an effective reference for subsequent researchers, coaches, school teachers, and parents.

1.5 Research Objectives

i. To investigate the content composition and motor skill composition of a fundamental motor skills intervention program for children aged 3-6 years old.

ii. To determine gross motor skills level (stationary performance, locomotion, and object manipulation) and fine motor skills level (grasping and visual-motor integration) among 3-6 years old children in Chengdu,China.

iii. To determine relationship of gross motor skills (stationary performance, locomotion, and object manipulation) and fine motor skills (grasping and visual-motor integration) among children aged 3-6 years old in Chengdu,China.

iv. To compare the pre-test and post-test score after long-term of customized fitness program on gross motor skill level (stationary performance, locomotion, and object manipulation) and fine motor skill level (grasping and visual-motor integration) among 3-6 years old children in Chengdu,China.

v. To determine the differences in term of long-term adaptation to specific physical fitness program based on age group between children aged 3-6 years old in Chengdu,China.

1.6 Research Questions

i. What kind of motor skills typically used in intervention programs for improvement of fundamental motor skills among 3-6 years old children?

ii. What is the gross motor skills level (stationary performance, locomotion and object manipulation) and fine motor skills level (grasping and visual-motor integration) among 3-6 years old children ?

iii. Is there any relationship across children aged 3-6 years old in term of gross motor skill level (stationary performance, locomotion, and object manipulation) and fine motor skill level (grasping and visual-motor integration) among 3-6 years old children ?

iv. Is there any significant difference in pre-test and post-test score, in motor skills performance after long-term application, of customized specific physical fitness program on gross motor skills level (stationary performance, locomotion and object manipulation), and fine motor skills level (grasping and visual-motor integration) among 3-6 years old children in ?

v. Is there any a significant difference in term of long-term adaptation to customized specific physical fitness program based on age group between 3-6 years old children in Chengdu, China?

1.7 Significance of Study

Through scientific evaluation, customized specialized intervention, and rigorous data analysis, this study provides an in-depth understanding of the development of fundamental motor skills in children aged 3-6 years in Chengdu City, Sichuan Province, China. It will provides an analysis of the variability of motor skill development in children aged 3-6 years old, clearly presents the correlations among the five categories of motor skills; and provides the impact of customized specialized intervention model on the overall motor skill development of children aged 3-6 years old. The above objectives will provide an important reference for professionals in the development of motor skills in 3-6 years old children. It also aims to promote the society's in-depth attention to the development of motor skills in children aged 3-6 years old.

1.8 Limitations of the Study

i. The main subjects of this study were children aged 3-6 years old in a random sample of thousands of students in a motor skills development center in Chengdu, Sichuan Province, China, and the data were not sufficiently representative of the national level.

ii. This study was influenced by students' initiative and teachers' teaching level, both of which need to be effectively monitored and excluded.

iii. The development of motor skills in 3-6 years old can also be influenced by a variety of factors including the child's heredity, genes, nutritional diet, and growing environment, including mental health. Each of these dimensions needs to be addressed by inviting relevant professionals to join in the study of promoting motor skill development in young children, and a collaborative study may provide more comprehensive and objective results and conclusions. This study is limited to providing further understanding of the analysis of motor skills of 3-6 years old in Chengdu city, Sichuan province, China, as well as providing a reliable reference for modeling and content design to promote the development of motor skills in young children aged 3-6 years old, and providing new directions and options for further comparisons and selections at a later stage.

1.9 Delimitations of the Study

i. The population of this study was children aged 3-6 years old in Chengdu City, Sichuan Province, China, excluding children in other cities.

ii. The motor skill assessment tool used in this study was unified as the PDMS-2 Motor Development Scale, and no other scale was used for data collection.

iii. During the execution of this study, the researcher fixed personnel, thus effectively reducing the error of manual assessment.

iv. The customized specialized intervention program of this study is a uniformly developed program, and no other programs were conducted during the process.

v. In this study, the coach who carried out the intervention were specialized personnel who had undergone 3 months of specialized training, and those who had not been trained were not allowed to participate in the implementation of the intervention.

vi. The results of this study are provided for scientific analysis only, and no real-name information about the children will be published except by the children's guardians.

vii. The findings and conclusions of this study are limited to providing data support and guiding the model.

viii. All children and their parents were briefed on the purpose and process of the program and signed an informed consent form before participating in the program.

1.10 Operational Definition

i. **Motor skills (MS):** It is the muscle movements that people used in daily lives. From walking to running to brushing our teeth, people cannot do without motor skills. Motor skills are the functioning of the body's muscles to accomplish a task through specific movements of the body's muscles. These tasks include walking, running, or biking. To accomplish this skill, the body's nervous system, muscles, and brain must work together. The goal of motor skills is to optimize the success and accuracy of performing the skill and to reduce the energy expenditure required for performance. Performance is the act of executing a motor skill or task. Consistent practice of specific motor skills greatly improves motor performance, leading to motor learning. Motor learning is a relatively permanent change in the ability to perform a skill through continued practice or experience (Haywood, 2018) . Motor skills encompass both gross and fine motor skills (Lu, Huihui, Leqin, & Xuexue, 2019).

ii. **Gross Motor Skills (GMS):** Gross motor skills– require the use of large muscle groups in our legs, torso, and arms to perform tasks such as: walking, balancing, and crawling. The skill required is not extensive and therefore are usually associated with continuous tasks. Much of the development of these skills occurs during early childhood. Children use our

Gross Motor Skills daily without putting much thought or effort into them. The performance level of gross motor skill remains unchanged after periods of non-use. Gross motor skills can be further divided into two subgroups: Locomotion skills, such as running, jumping, sliding, and swimming; and object-control skills such as throwing, catching, dribbling, and kicking(Rathus, 2011).

iii. **Fine Motor Skills (FMS): F**ine motor skills – require the use of smaller muscle groups to perform smaller movements. These muscles include those found in our wrists, hands, fingers, feet and in our toes. These tasks are precise in nature like playing the piano, tying shoelaces, brushing your teeth, and flossing. Some fine motor skills may be susceptible to retention loss of over period e if not in use. The phrase "if you don't use it, you lose it" is a perfect way to describe these skills, they need to be continuously used. Discrete tasks such as switch gears in an automobile, grasping an object, or striking a match, usually require more fine motor skill than gross motor skills(M. Gila Claisse, 2020).

iv. **Stationary performance (SP):** This skill refers to a child's ability to control their body (Folio, 2000).

v. **Locomotion (LM):** This skill refers to a child's ability to move from one place to another, such as walking, running, jumping, etc (Folio, 2000).

vi. **Object Manipulating (OM):** Refers to the child's ability to control the body to control objects, such as throwing tennis balls, kicking objects, etc (Folio, 2000).

vii. **Grasping (G):** This skill refers to the functions of children's one or both hands fingers, such as finger test, button, etc (Folio, 2000).

viii. **Visual-Motor Integration (VM):** This skill refers to children's hand-eye coordination and assesses a child's ability to apply visual skills to perform complex hand-eye coordination tasks, such as building blocks, imitating drawing, etc (Folio, 2000).

ix. **Peabody Development motor scale-2 (PDMS-2):** The PDMS-2 is an excellent tool designed by Rhonda Folio for evaluating the motor development of young children as it provides separate tests and grading scales for both gross motor skills and fine motor skills (Folio, 2000).

x. **Month Age (MA):** Monthly age refers to the time that a young child has experienced growth from birth and is calculated in months. which in this study indicates the child's chronological age (Folio, 2000).

xi. **Biological age (BA) :** Biological age is a measure of health that can be more or less than chronological age—might help determine quality of life when get older, scientists say. The idea behind biological age is that cells and organs have ages that vary from the regular age. In the PDMS-2 assessment, biological age becomes the age equivalent, which is converted

from raw scores and is mainly used to compare the developmental age of children's gross motor skills (Folio, 2000).

xii. **Developmental quotient (DQ): I**n PDMS-2, the developmental quotient is converted from the biological age (age equivalents) of motor skills, that is, the developmental quotient = biological age/chronological age) * 100%. The value and significance of this indicator is the same as the previous biological age, and it uses another more intuitive way to present the development level of children's motor skills (Folio, 2000).

xiii. **Raw Score (RS):** Raw Score is the direct score administered by the researcher as the child completes each movement. For direct data. Each category of motor skills has a total score (Folio, 2000).

xiv. **Standard Score (SS):** In PDMS-2, the standard scores of various motor skills are converted from the raw scores. In the PDMS-2 assessment manual, there are corresponding scales for conversion of standard scores and original scores. The standard score of motor skills in each category can clearly show the developmental level of the same child in different motor skills, and can clearly see which motor skills are relatively weak and which motor skills are relatively strong (Folio, 2000).

xv. **Sports Ability (SA):** Analysed from the perspective of Physical Education, Sports Ability refers to the ability of a person's body to cope with daily physical activities, athletic training, special competitions, and survival

challenges. It is a combination of a person's level of knowledge about the body, body awareness ,as well as a person's physical posture, physical fitness, physical function, physical skills, and mental abilities.

xvi. **Children Sports Ability Training (CSAT):** CSAT refers to the customized, specialized intervention model designed for use in this study to promote the development of motor skills in children aged 3-6 years old. This model contains (1) the key elements needed to promote motor skill development in 3-6 years old children, (2) the recommended content needed for motor skill development at each age, (3) the design of the training content for each month of motor skill development, and (4) the elements of the curriculum structure design for a single-session motor skill development training program for 3- to 6-year-old children, as recommended based on age characteristics.

1.11 Conceptual Framework of the Research

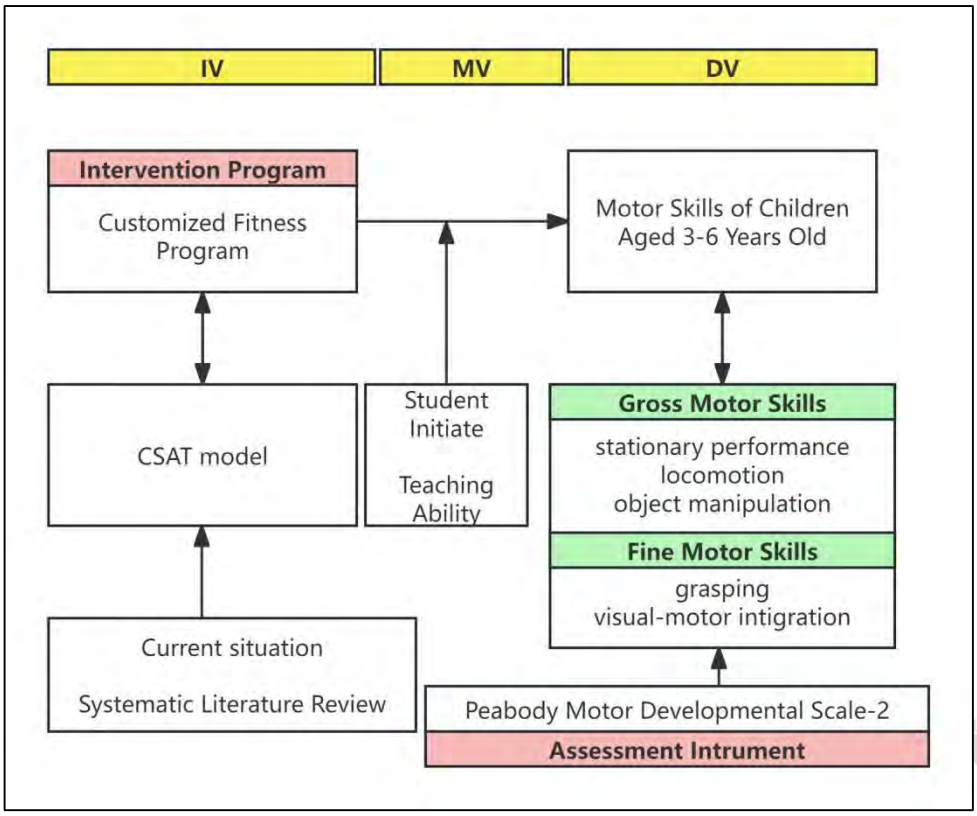

Figure 1.1. Conceptual Framework of the Research

The preceding conceptual framework clearly displays the study's independent, dependent, and moderating variables. The independent variable, which also serves as the intervention program for this study, is the Customized Fitness Program, which is a specially designed intervention program to improve the fitness of children aged 3-6 years old in terms of motor skills based on the CSAT model developed by the authors of this study.

The authors of this study constructed the CSAT model based on the current state of physical fitness and motor skill development in Chinese children aged 3-6 years, related theories, and a comprehensive literature review during the previous ten years.

The moderating variables are students' initiative and teachers' and coaches' teaching ability. Both variables were clearly standardized, instructed, and trained during the research process so as to improve the accuracy and reliability of the study.

The dependent variable is 3-6-year-old children's motor skills, which include both gross and fine motor skills. In this study, the Peabody Motor Developmental Scale-2 (PDMS-2) was used to measure motor skills in 3-6 year olds.