



# A Construction of Physical Exercises Program at Home to Improve Physical and Mental Development for the Children with Mental Retardation

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Received 25/12/2023

Revised 08/01/2024

Accepted 21/01/2024

## Abstract

**Background and Aim:** The Fifth Plenary Session of the 18th CPC Central Committee issued the outline of the Healthy China 2030 plan, and the health problem of the disabled was put forward as one of the key problems to be solved. According to our world in data 2016, there were about 11 million men and 8 million women with children with mental retardation in our country. The incidence of children with mental retardation in our country ranks first among five major countries in the world. Studies had shown that the incidence of overweight and obesity in children with mental retardation was significantly higher than that of normal peers. Coupled with limited intellectual ability, sedentary lifestyle and lack of exercise, lack of social support related to physical exercise, and other factors, being overweight and obese had a great impact on the physical, psychological, and social functions of children with mental retardation, and this impact may continue into adulthood, posing a serious threat to physical and mental health. Therefore, how to promote physical exercises for children with mental retardation, to promote their physical and mental health has become one of the important topics paid attention to by the researchers.

**Materials and Methods:** Some 31 experts participated in this study, divided into three groups: the first group consisted of 7 experts who conducted expert interviews; the second group organized 19 experts who used the Delphi method to conduct argumentation; and the third group consisted of 7 experts who appreciated the method. Researched process : (1) Collecting literature; (2) Organizing expert interviews. The influencing factors and environment of family exercises for children were discussed, 191 movements were designed and screened, and the content system of movements for home physical exercises was initially constructed. (3) 19 experts were selected by purposeful sampling method, and three rounds of the questionnaire were used to verify the index system by Delphi method; (4) Verify physical exercises program through connoisseurship; (5) Develop and implement physical exercise programs at home to meet the different psychological needs.

**Result:** (1) The content index system of family physical exercise for children with mental retardation was preliminarily established, including 191 action indicators; (2) after two rounds of validation of the expert's Delphi questionnaire, 2 level 2 indicators of the warm-up module and 11 level 3 indicators of physical exercise module were excluded. The mean value of the remaining indicators was  $>3.5$  and  $CV<0.25$ , and other indicators were retained; (3) after the connoisseurship by seven experts, the indicator system was finalized, including 3 first-level indicators and 22 second-level indicators in the warm-up module. 5 level 1 indicators, 17 level 2 indicators, and 135 level 3 indicators for the physical exercise module. 3 level 1 indicators and 21 level 2 indicators for the relaxation and stretching module; (4) prepare 5 physical exercise programs with different psychological needs, and practice them.

**Conclusion:** (1) Starting from the individual level, interpersonal level, and community level, this project highlighted the core status of the children, paid attention to the interaction form and environment maintenance at the community level, and promoted the development of children's sports desire and psychomotor needs. (2) The program cleverly combines professionalism and practicality, ensuring that children with different needs can find the right speed and type of exercise for them at home. Through this program, children with mental retardation cannot only enjoy tailored exercise programs but also receive ongoing motivation and support in interaction and innovation, making health and vitality a goal within reach of every family with exceptional children.

**Keywords:** Mental Retardation; Social-Ecological Systems; Physical Exercises; Family Education

[175]

Citation



Wang, T., Hongsaenyatham, P., Soachalerm, A., & Han, H. (2024). A Construction of Physical Exercises Program at Home to Improve Physical and Mental Development for the Children with Mental Retardation. International Journal of Sociologies and Anthropologies Science Reviews, 4 (3), 175-188; DOI: <https://doi.org/10.60027/ijsasr.2024.4085>



## Introduction

Children with mental retardation are a special group that needs special care from society. There is a long-standing prejudice and lack of awareness of children with mental retardation in society, which leads to their exclusion from sports activities or discrimination. Their families are often under certain psychological pressure, which limits their enthusiasm and opportunities to participate in sports to a certain extent. Xie (2011); Skinner & Piek (2001) Luo (2009) Wang (2007) Westendorp, et al. (2011); Fang (2019); Li (2014), Westendorp, et al. (2011), Liu (2019) and other studies agree that there are many differences between children with mental retardation and ordinary children in personality, psychological and cognitive characteristics. Their gross motor development is superior to fine motor development and motor coordination is poor. Hamm & Siebert (2013) found that the overall level of disabled children's participation in community activities was lower than that of normal children.

For children with mental retardation, home exercise is not only an effective way to improve their physical health but also an important means to promote their cognitive development and social adaptability. With its unique practicality and adaptability, home physical exercise breaks through the limitations of time and space, making fitness activities more personalized and flexible, without having to bear social prejudices and long commutes. Children can start fitness activities at home at any time. But home workouts also face some challenges and limitations, one of which is the correctness of the movements and the safety of the exercise. This needs to take into account not only the safety and fun of the movement but also the physical and psychological characteristics of children with mental retardation, as well as the challenges they may face in imitation, memory, and execution of the movement. The question of this study is: What should be the physical exercise program for children with mental retardation at home? What factors need to be considered?

Therefore, it is necessary to develop special home exercise programs for children with mental retardation. This study adopts five steps: literature research, expert interview, expert survey, questionnaire survey, and appreciation. Based on the literature research and the opinions of 7 experts interviewed, this paper initially constructs the movement content system framework suitable for the physical activity of children with mental retardation at home and focuses on the movement of practice. Two rounds of expert questionnaire surveys were conducted on the preliminary content system by the Delphi method, and the resource base of exercise content suitable for physical activity at home was determined. At last, the method of appreciation is adopted to demonstrate and form the final content system of physical activity at home. According to the content system of physical activity at home, the exercise program to meet different psychological needs is constructed and tested in practice.

## Objectives

To construct a family physical exercise program for children with mental retardation.

## Literature Review

At the beginning of the last century, foreign countries began to study the impact of exercise on physical health and exercise ability for people with intellectual disabilities, mainly studying the means and methods of exercise intervention, including aerobic training, resistance training, aerobic and resistance combined training methods and other intervention methods. The intervention time is generally 10-15 weeks, and the conclusions of intervention effects are different. The sports training for children with mental retardation should be entertaining and game-oriented so that children can feel the fun of sports in the training process. Li, et al. (2016) believe that the behavior shaping of physically disabled children participating in sports is largely influenced by environmental, individual, and social factors, and the improvement of physical fitness is not only through sports intervention at the individual level but also involves multiple aspects of the social-ecological model. However, there is still a lack of a social-ecological model in the special population at-home sports intervention research.

In recent years, Chinese scholars have begun to pay attention to the relationship between sports and children with mental retardation, but there are still few relevant studies, which mainly focus on the study of the means and effects of sports intervention, such as the influence of track and field, basketball, tai chi, aerobics and other intervention programs on the physical health of children with mental retardation. The intervention duration varies from 23 weeks to 2-3 times a week. The intervention



subjects were 9-13 years old, and the relevant studies did not adopt a strict randomized controlled trial design. Due to poor comparability among non-randomized controlled trial groups, confounding bias factors could not be excluded and for other reasons, some research results had positive effects, but their conclusions remained to be verified (Yan, 2014; Zheng, et al, 2014; Taliaferro & Hammond, 2016; Beets, et al, 2009). However, using 12 weeks of core strength exercise to intervene in the balance ability of children with moderate intellectual disability found that the individual balance ability of children with moderate intellectual disability in lower grades varied greatly; Core strength exercise can effectively improve the balance ability of children with moderate intellectual disability, and has a strong sensitivity to the vestibular stability of children with mental retardation in lower grades. Wang & Wu (2018) found that exercise and health knowledge learning intervention can improve the physical activity level of people with intellectual disabilities, and proposed that individual function and ability are the direct factors, and social and environmental factors are the contributing factors to the enhancement of physical activity participation of people with intellectual disabilities. The different sports events have different impacts on people with mild intellectual disabilities. Dai, et al (2006) confirmed in their research that physical exercise has a certain impact on the intellectual development of children with mental retardation. Through physical exercise, it can ensure the normal activities of the nervous system and various organ systems of children with mental retardation, and help the intellectual development of children with mental retardation.

To sum up, the domestic research on exercise intervention for people with mental retardation is still in its infancy, and the research results can provide certain references for this research. However, the level of research in all aspects needs to be deepened. The main manifestations are: (1) The research results are not widely applied, mostly case studies, and lack of theoretical support for the mechanism of action. (2) The research content is too "broad" and not "deep" enough to reveal the mechanism of family physical exercises of children with intellectual retardation from the social, psychological, and biological perspectives. (3) Foreign theories are not localized, a large number of empirical studies have been copied and applied, the background analysis is not deep enough, and the theoretical summary is less.

## Conceptual Framework

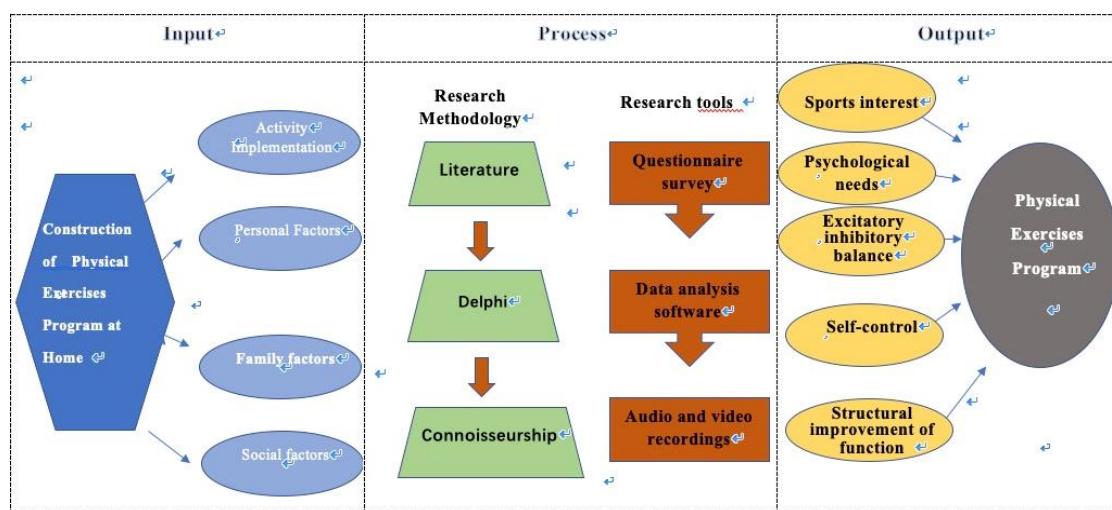


Figure 1 Conceptual Framework

## Methodology

### 1. Population and sample

According to the regional differences and expert knowledge structure in Guangdong province, 31 experts from five cities, such as Guangzhou, Shenzhen, Foshan, Zhongshan, and Huizhou, including doctors of pediatrics or rehabilitation, professors of physical training in universities, experts of special education in universities, physical education teachers in special schools and sports associations for the

disabled, were selected to participate in this study by purposive sampling method. They were divided into three groups: The first group consisted of 7 experts, who conducted expert interviews and built a preliminary index system of home exercise content; The second group of 19 experts used the Delphi method to demonstrate the action index; The third group of 7 experts used the connoisseurship method, including two experts who had participated in the Delphi method.

## 2. Research tools

This study mainly uses EXCELL and SPSS to conduct statistical processing on the data of in-depth interviews, questionnaires for consensus by the Delphi technique (online questionnaire star), and the connoisseurship method.

This study mainly used statistics

Mean (X)

Median (Mdn)

Standard Deviation(SD)

Coefficient of Variation (CV)

1. Based on literature and interviews with 7 experts, the influencing factors of family physical exercises for children with mental retardation were screened, and the program of physical exercises at home was initially established.

2. 19 experts were consulted by online questionnaire, face-to-face interview, telephone interview, and E-mail interview to test the validity of the program(Figure 2).

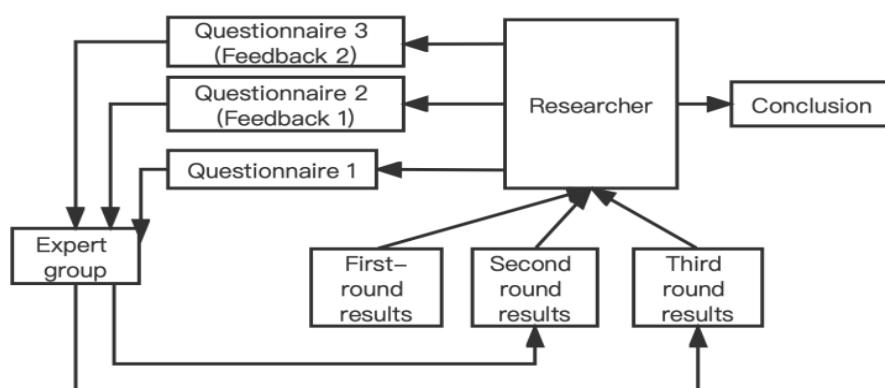


Figure 2 Research technology flow

## 3. Make connoisseurship reach a consensus

According to the requirements of the connoisseurship study, 7 experts were selected. These specialists include pediatricians (with experience in mental diagnosis) or rehabilitation doctors, specialists in special education, specialists in sports training, and specialists in sports for persons with disabilities. 7 experts were consulted to evaluate the physical exercises program for children with mental retardation at home.

## Results

### 1. Reliability analysis and validity of the Expert Questionnaire

The reliability and validity of this study are proportional to the recovery rate. It is generally believed that a recovery rate of less than 50% is the least ideal, a recovery rate of more than 60% indicates that the expert is motivated, and a recovery rate of more than 70% indicates that the expert is moderately motivated (Su, 2012). The response rate and effective rate of the two rounds of questionnaires both reached more than 70%, indicating that the positive coefficient of experts was above the medium level. The degree of expert authority is mainly determined by the coefficient of expert judgment and the degree of familiarity with the content of the consultation. The results of the expert questionnaire show that the authority coefficient of experts in both rounds is greater than 0.7. The degree



of coordination of expert opinions is mainly reflected in the coefficient of variation (V) and Kendall coefficient (W). The specific is:  $W = \frac{S}{1/12[K^2(N^3-N)-K \sum_{i=1}^k T_i]}$

It is generally believed that the lower the coefficient of variation, the more consistent the experts' judgment on the importance of the indicator. The lower the W value, the more professional and consistent it is. After two rounds of statistics, W values are between 0 and 1, and  $P < 0.05$ , indicating a good degree of expert opinion coordination.

## 2. Screening the movement content index of home physical exercises for children with mental retardation

### 2.1 Analysis of first-round screening results

Based on a large number of literature and referring to the measurement indicators and methods in the experimental data scale developed by domestic and foreign researchers, this study adopted the purpose-based sampling method to select 7 experts in the fields of medicine, sports training, special education, psychology, disabled persons' sports, etc., to conduct a preliminary screening of the influencing factors of family physical exercise for children with mental retardation and the action content of physical exercise. Experts in sports training believe that attention should be paid to the scientific nature of sports technology and the efficiency of sports. Experts in psychology believe that attention should be paid to the psychological adaptation and change of mentally disabled children's sports participation. Special education experts emphasize the individual differences of children with mental retardation and pay attention to the psychological behavior of children with mental retardation. Medical experts put forward that sports cognition should conform to the physical and mental development characteristics of mentally disabled children.

After several rounds of discussion, 7 experts believed that attention must be paid to the environmental maintenance of physical exercise for children with mental retardation and the impact on individual behavior. They suggested starting from the individual level, interpersonal level, and community level, highlighting the core status of children with mental retardation, focusing on the support improvement and health allocation of the interpersonal level, focusing on the interaction form and environment maintenance of the community level, stimulating the movement desire of children with mental retardation through environmental changes, and cultivating the habit of psychomotor needs. Su (2012) analyzed the factors affecting individual behavior in terms of psychological factors and proposed several aspects that influence individuals' participation in sports, including self-efficacy, enjoyment of exercise, benefits of exercise (pros), and perception of barriers (cons), etc. 7 experts focused on personal motivation and proposed the influencing factors for children with intellectual disability to participate in sports, including five different psychological fields: body function structure improved, sports interest, psychological needs, balance between excitation and inhibition, and self-control. To achieve the goals in these five areas, the author divided the physical activity of children with mental retardation at home into three modules according to the opinions of seven experts: the warm-up module, including three first-level indicators, and 24 second-level indicators. Physical exercise module, including 5 first-level indicators, 17 second-level indicators, and 146 third-level indicators. The relaxation tension module contains 3 first-level indicators and 21 second-level indicators. The 7 experts agreed on the above plan and suggested several considerations for its implementation (see Figure 3).



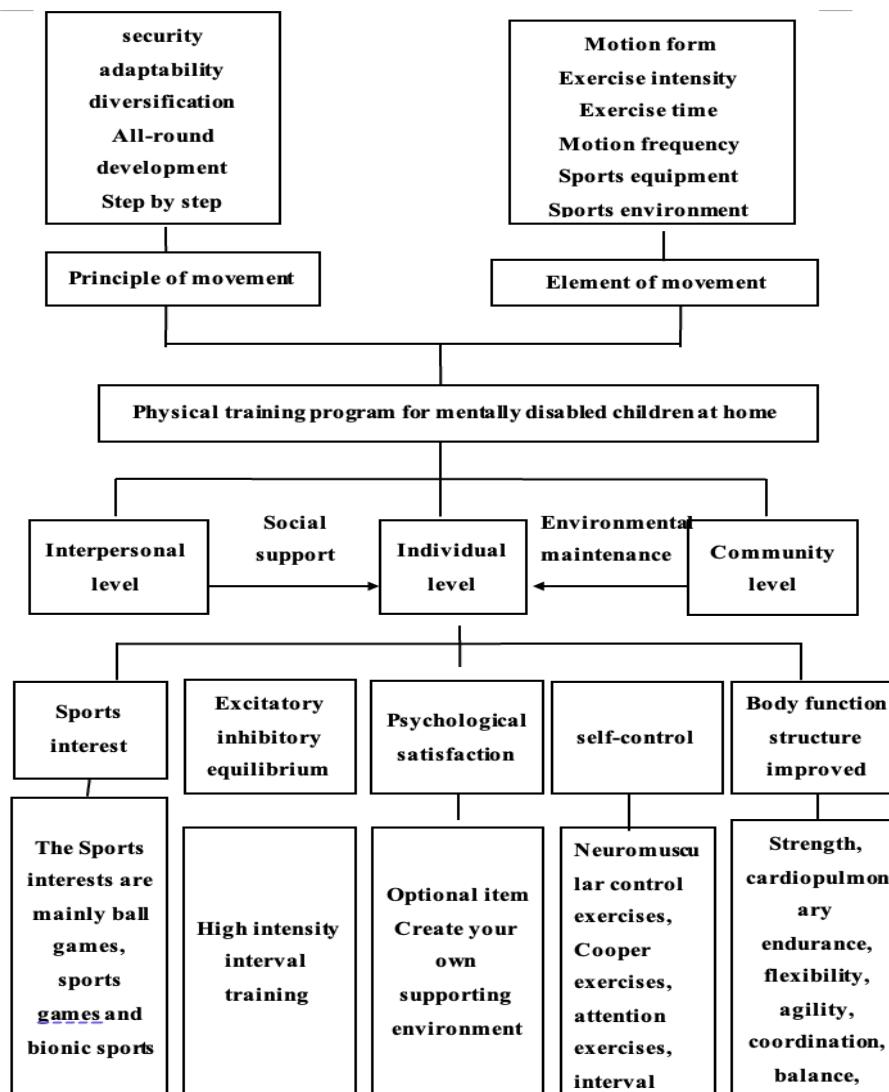


Figure 3 An overall framework of the home physical exercise program for children with mental retardation

## 2.2 Analysis of second-round screening results

To ensure the effectiveness of index screening, the measurement methods of average value and coefficient of variation are adopted. It is generally believed that if the mean is less than 3.5 and the coefficient of variation is greater than 0.25, it should be deleted (Luo, 2009). The results show: In the indicator screening of the warm-up module, the mean value of the primary indicators is  $>3.5$  and the coefficient of variation is  $<0.25$ , so they pass the test and all indicators are retained. In the secondary indicators, the mean value of A2.10 and A2.4 is  $<3.5$  and the coefficient of variation is  $>0.25$ , so they are deleted and the rest of the indicators are retained.

In the indicator screening of the physical exercise module, the mean value of the primary indicators was  $>3.5$  and the coefficient of variation was less than 0.25, so they passed the test and all indicators were retained. Among the secondary indicators, B1.1.16, B1.1.28, B1.1.29, B1.2.4, B1.2.6, B1.2.7, B1.4.8, B1.4.10, B1.4.11, B4.2.6, and B5.1.4 have a mean value of  $<3.5$  and a coefficient of variation of  $>0.25$ , and based on the expert's recommendations, these 11 indicators were deleted and the rest were retained. indicators are retained.

In the relaxation and stretching module, the mean values of the primary and secondary indicators were  $>3.5$  and the coefficients of variation were less than 0.25, and all items passed the test and were retained, resulting in the third round of the movement content indicator system.



### 2.3 Analysis of the third-round screening results

After the second round of expert evaluations, in the third round of questionnaires, the warm-up and preparation module had 3 level 1 indicators and 22 level 2 indicators; the physical exercise module had 5 level 1 indicators, 17 level 2 indicators, and 135 level 3 indicators; and the relaxation and stretching module had 3 level 1 indicators and 21 level 2 indicators.

After the third questionnaire method, the mean value of 178 action indicators in total for the three modules level 1, level 2, and level 3 indicators was  $>3.5$ , and the coefficient of variation was less than 0.25, so they passed the test, and all indicators were retained to form the final content system of physical exercises at home.

### 2.4 Connoisseurship argument

The first-level, second-level, and third-level indicators of the three modules of the home exercises program were demonstrated by the connoisseurship method. The results show that the average value of primary, secondary, and tertiary indicators is greater than 3.5, and the coefficient of variation is less than 0.25. The test passes and all items are retained. Based on the ecological model of "individual, family and society", the content system of family sports activities for children with mental retardation was formed, including warm-up preparation, physical exercises, and relaxation and stretching. The warm-up preparation module can be achieved through 22 exercises such as aerobic fitness, dynamic stretching, and core muscle activation. The physical exercise module can be implemented from 17 secondary indicators and 135 movement exercises in five target areas: structural improvement of physical function, interest in sports, psychological demand, balance of excitation and inhibition, and self-control. The relaxation stretching module can be implemented through 21 movement exercises such as static stretching, dynamic stretching, and mental and breathing relaxation.

## Discussion

A completed workout consists of three parts: warm-up preparation, physical exercises, and relaxation stretching, each with its specific function.

### 1. Analysis of the movement content of the warm-up preparation

Warm-up activities are divided into general warm-ups, static stretching, specialized warm-ups, and dynamic activities (Kahraman, et al, 2023). Static stretching has a twofold effect on children. If static stretching is performed during warm-up rather than after exercise, it may not activate the muscles that are about to be exercised, and sometimes may even lead to decreased performance or increased risk of injury. The children's cardiorespiratory development is still immature, and static stretching commonly requires breath-holding, which may be detrimental to children, and the content of movements that may require breath-holding should be minimized. Unlike static stretching, dynamic stretching is done on the move. In addition to increasing the range of motion of the joints, enhancing the elasticity of the muscles and tendons, and improving the performance of the muscles and tendons to a certain extent to play a role in the prevention of sports injuries, it can also mimic the muscular activities during exercise more effectively, to make the body better adapted to the ensuing activities. In addition, dynamic stretching for children can effectively reduce breath-holding, which is beneficial to the development of children's cardiopulmonary function. Therefore, static stretching was excluded from the warm-up preparation part of this program, and dynamic stretching was selected. In the initial 10 movement indexes of the dynamic stretching exercise, the mean value of single-leg support stretching and prone hand-foot forward walking was  $<3.5$ , and the coefficient of dispersion was  $>0.25$ , these two indexes were discarded (Table 1), and the other indexes were retained. The analyzed movements require good body balance and coordination, are difficult for younger children, and should be practiced differently for children with different abilities.





**Table 1** The mean value, median, standard deviation, and coefficient of variation of the second round of second-level indicators deleted in the warm-up preparation part

Part	Second level indicators	Mean	Median	S.D.	CV
Warm-up Dynamic stretching	A2.4 Single leg support extension	3.46	3	1.202	0.35
	A2.10 Step forward on your hands and feet	3.49	4	1.100	0.32

The core is the focus of almost all sports and is one of the most important "power sources" in the human body. Having a stable core makes physical exercises safer. There are many ways to activate the core muscles, including planks, sit-ups, aerobics, and total body exercises that directly or indirectly increase the strength of the core muscles. Given the home environment, five representative core muscle group exercise movements were selected for the core muscle group activation exercises in this study, and the mean value of all the indexes was  $>3.5$ , and the coefficient of dispersion was  $<0.25$ , all of which were retained.

A general warm-up usually refers to a non-specific, full-body warm-up. Aerobic exercise, especially at low to moderate intensity, is designed to increase overall body temperature and heart rate and provide a basic warm-up for all parts of the body. Aerobic fitness is a very good choice for a general warm-up. Gentle aerobic exercise can also help children mentally prepare to face more intense training. Expert scores also confirmed the above analysis, the selected 9 movement exercise indicators, mainly low-intensity systemic warm-up, all indicators passed the test.

The warm-up exercise may seem simple but it contains a wealth of knowledge about exercise. It is as much about ensuring that all parts of the body are properly trained as it is about focusing on the coordination between the various exercises. Typically in a warm-up session, the general warm-up (aerobic fitness) comes first, dynamic stretching in the middle, and specialized warm-up exercises follow. The three are complementary and the exercises need to be done sequentially. Gradually increasing the intensity of the exercise as the warm-up progresses helps to acclimatize the cardiorespiratory system and muscles to the higher intensity of the upcoming exercise. Warming up is also a favorable time to concentrate, adjust breathing, prepare your mental state, and reduce tension and anxiety. Finally, warm-ups should not be too long or too short. Generally speaking, a warm-up lasting about 10-20 minutes is appropriate. After the warm-up is over, there should be a smooth transition to the main exercise or drill of the workout.

## 2. Movement content analysis of physical exercises

### 2.1 Structural improvement of body function

**Table 2** The mean value, standard deviation, and coefficient of variation of the second round of three-level indicators deleted in the physical exercise part

Third-level indicators	Mean	Median	S.D.	CV
B1.1.16 Push-ups	3.37	4	1.054	0.3
B1.1.28 Supine wiper	3.49	4	1.079	0.31
B1.1.29 Side-lying straight-legged abduction	3.47	4	0.937	0.27
B1.2.4 Burpee Jump	3.44	4	1.129	0.33
B1.2.6 Lunge jump	3.48	4	1.079	0.31
B1.2.7 Hiking	3.49	4	1.129	0.32
B1.4.8 Cross hands and feet	3.3	4	1.068	0.32
B1.4.10 High leg sideways movement	3.38	4	1.195	0.35

Third-level indicators	Mean	Median	S.D.	CV
B1.4.11 Clown jump	3.4	4	1.157	0.34
B4.2.6 Flat jumping jacks	3.43	4	1.079	0.31
B5.1.4 Burpee Jump	3.46	4	1.049	0.30

Due to space and facility constraints, exercises suitable for children's home exercise include strength, cardiorespiratory endurance, flexibility, agility and coordination, balance, and correction of poor form. Strength movement exercises were categorized into basic and advanced exercises. In the screening of movement indicators, the mean value of push-ups, supine wipers, and side-lying straight-legged abduction was  $<3.5$ , and the CV was  $>0.25$ (table 2). It was analyzed that children's strength qualities developed later compared with other qualities and that they generally had insufficient upper limb strength and lacked exercise in their core strength, so even if older children could complete the movements, it would be difficult for them to complete the required number of movements, and the accuracy of the movements was greatly reduced, weakening the effect of the exercise. Delete this indicator. The mean value of the burpee jump, lunge jump, mountaineering step for developing cardiorespiratory endurance, front and back cross-hand touching foot, high leg lateral movement, clown jump for developing agility and coordination, and the mean value of flat plate open and close jump for developing balance ability was  $<3.5$ , and the CV was  $>0.25$ (table 2). It was analyzed that the main reason was that these movements were mostly the combination of several exercises, and the difficulty of the exercise not only appeared in the movement itself but also required a certain level of cognition. In addition, these movements have certain safety risks, and the accuracy and standardization of the movements make it difficult for parents to provide guidance, which is not conducive to the continuity of individual exercise, so these movements were also deleted.

## 2.2 Sporting Interests

For children with mental retardation, their interest in sports may be influenced by particular challenges to their cognitive, emotional, and social abilities, and are susceptible to time, place, occasion, and other factors. In addition, interest varies with age and cultural background. This also provides space for environmental changes to promote the development of sports interests of children with mental retardation. This program develops a perceptual interest in bionic movement, enriches the emotional experience with interesting ball exercises, and stimulates volitional interest in sports games to accomplish tasks. Three secondary indexes and 18 tertiary indexes were set up. The mean value of all indexes was greater than 3.5, and the CV value was  $<0.25$ . All indexes were unanimously approved by experts. It is worth mentioning that the bionic movement introduced Animal Flow. It is a fitness method developed based on animal movements and behaviors, focusing on self-weight training and technical body exercises. These movements promote the continuous development of children's basic motor characteristics (coordination, strength, stability, speed, and flexibility), well stimulate children's potential to learn specific skills when participating in various sports, and image imitation can relate to the life experience of children with mental retardation, easy to stimulate the interest in practice. Crabbing, for example, mimics what crabs do when they crawl (Figure 4).

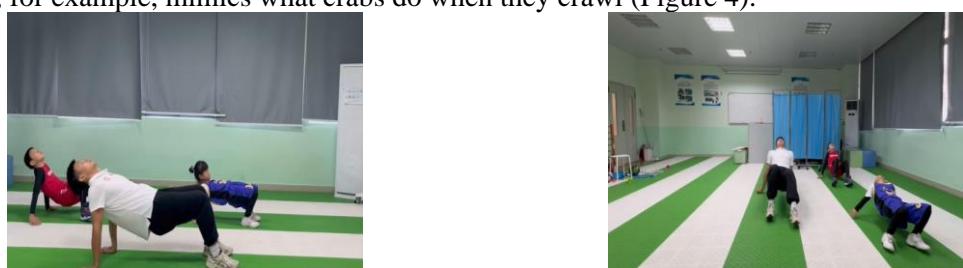


Figure 4 Crab crawling



### 2.3 Psychological needs

The theory of basic psychological needs proposed by psychologists Richard M. Ryan and Edward L. Deci suggests that human beings are born with three of the most basic psychological needs: the first is the need for self-directed exploration and curiosity. The second is the need for achievement or competence, and the third is the need for affinity or companionship. According to these three types of needs, the program is targeted to design autonomous exercises, while introducing virtual sports and relying on a huge range of physical games to increase children's choice of space. Challenge sports are the best choice to stimulate children's interest and gain success in sports, helping children build up self-confidence, experience the fun of success, and achieve self-realization through completing challenges. The need for companionship is natural for children. Parent-child sports are not only beneficial to children's physical health but also help to establish and develop family relationships, which is the most important form of activity for children with mental retardation to participate in sports. A total of 3 secondary indicators and 14 tertiary indicators were selected for this part, and the mean value of all the indicators was greater than 3.5, with a CV value of  $<0.25$ , and the indicators were unanimously recognized by experts. It was analyzed that the exercise movements selected in this section were more in line with the children's psychological needs, with various forms of practice, rich emotional experience, moderate coefficient of difficulty of the movements, plus the participation of parents or peers, which gave more guidance to the children and improved their confidence. In the practice exercise, this part of the exercise is also the most willing to participate in the children's exercises, the sound of laughter is endless. For example, the double-assisted open and close jump.

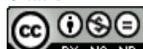
### 2.4 Balance of excitation and inhibition

The psychology of mentally disabled people is complicated, and over-excitement and over-inhibition are some of the important manifestations of their psychology. Liu, et al (2018) proved through experiments that different intensities of physical exercise can improve the excitement and inhibition of people with intellectual disabilities. This program is designed by integrating emotional regulation and cognitive control at the psychological level, behavioral response, and social interaction at the behavioral level. The exercise characteristics of High-intensity Interval Training (HIIT) are used to develop the ability to regulate nerve excitation and inhibition. To this end, the author designed two sets of HIIT schemes: lying position and standing position. The results show that except for the mean value of flat jumping jacks  $<3.5$  and CV value  $>0.25$  (table 2), the mean value of other indicators is greater than 3.5, CV value  $<0.25$ , and the indicators are retained. It indicates that experts hold the same opinions on the efficiency and science of HIIT. Analysis suggests that HIIT can not only improve cardiopulmonary function and fat loss effect but also help strengthen muscles and improve sports performance. It should be noted that the physical condition of children with mental retardation, appropriate intervals and rest times, as well as the correct posture and movement, the duration of the movement, and the length of the interval, need to be carried out under the guidance of parents to ensure the training effect and safety. In conclusion, HIIT can provide children with mental retardation with a fun, challenging and effective form of exercise that can help improve their physical health and quality of life.

### 2.5 Self-control

Self-control is the ability of an individual to regulate behavior autonomously and match it to personal values and social expectations. It can trigger or stop specific behaviors such as inhibiting impulsive behavior, resisting temptation, and delaying gratification. Self-control mainly includes emotion regulation, impulse control, and attention regulation, etc. The self-control training in a particular domain can likewise help to improve the power of control in other domains. Muraven's series of studies also came up with the idea that when people complete self-control training in a particular domain in which they are good, or in which it is relatively easy for them to do so, the effects of their training can be transferred to other domains in the same way. The above conclusions provide the theoretical basis for the creation of movements in this study. Therefore, medium-intensity aerobic exercise was selected for this program to develop the ability of emotional regulation, periodical training of sharp stops and starts to develop the ability of impulse control, and attention-type exercise to develop sustained attention.

The results of the indicator screening showed that the mean value of the indicators was greater than 3.5 and the CV value was  $<0.25$ , except for the Burpee Jump, which was consistent with the result



of the deletion of the Burpee Jump in cardiorespiratory endurance. It was analyzed that the Burpee Jump, as a combination exercise technique, has certain requirements for physical conditions and motor cognition. Analysis of other indicators: Aerobic exercise is a very effective way of emotion regulation, which can help improve emotional state, reduce stress, and improve mental health. Of course, the effects of aerobic exercise vary with individuals and exercise intensity, and optimal mood regulation is usually combined with moderate and regular aerobic exercise. Sharp stop-and-start type exercises are an effective movement practice that can promote neuromuscular control. Constantly challenging the body to make split-second adjustments to its movement state, helps to improve reaction time, coordination, precision, and strength of neural connections, which in turn improves movement skill and control. The attention-based movement focuses on the interaction between the body and the mind; it emphasizes focus, concentration, and mental engagement, paying attention to one's breathing, body posture, and sensations. An example of this is ants moving house (Figure 5).

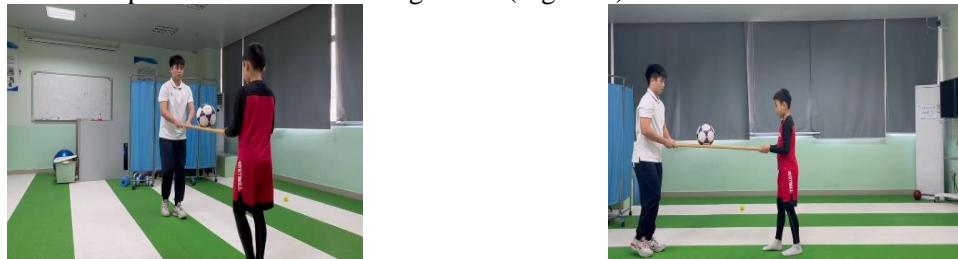


Figure 5 Ants move house

In summary, the function of motor skills for home-based physical exercises is multifaceted. When choosing exercise programs and methods, it is necessary to make gradual progress, with the amount of exercise varying from small to large, the intensity varying from weak to strong, and the difficulty of movements varying from simple to complex, while paying attention to the children's psychological adaptability and needs. The ability of children with mental retardation to improve through physical exercise requires not only the selection of scientific and effective exercise content but also long-term persistence and effort. These cannot be achieved without the continuous support of the family ecosystem, which requires participation at the individual level, encouragement and accompaniment at the social level, and health promotion and environmental improvement at the community level. The positive interactions at each level and the iterative transmission of roles will have an impact on home-based physical exercises for children with mental retardation with the long-term and careful help of parents. Therefore, a social environment that is understanding, inclusive, supportive, and provides appropriate resources can provide more development opportunities for children with mental retardation, helping them to give full play to their potential and enhance their abilities and self-awareness.

### 3. Analysis of the movement content of relaxation stretching

Relaxation exercise is the cooling after exercise, it is the same as the warm-up before exercise can't be ignored, the end of the exercise can't be immediately after the end of the state of static rest, which will lead to the muscles and other tissues of the blood can't be redistributed, resulting in part of the organs appear ischemia, lack of oxygen in the brain, prone to dizziness, nausea and even shock. Stretching activities after exercise are very necessary, which can effectively relieve muscle tension, eliminate fatigue, and release psychological pressure. This program divides relaxation stretching into static stretching, dynamic stretching, and breathing meditation exercises. The stretches cover the head and neck, chest and back, waist and hip, legs, and feet and ankles. Breathing focuses on regulating frequency and depth to help lower heart rate, reduce stress and anxiety, and promote relaxation of the body and mind. Of the 21 movement practice indicators included, both physical and mental relaxation were included. The mean value of all the indicators was greater than 3.5, and the CV value was <0.25. This indicates that the experts' understanding of the form of stretching and relaxation is more unified, and the selection of indicators is more reasonable. It should be noted that relaxation techniques after exercise should be adjusted according to individual needs and situations. Different relaxation methods

can produce different effects in different situations. Usually, the combined use of multiple relaxation techniques can better promote whole-body relaxation and recovery.

#### 4. Analysis of home-based exercise programs for different psychological goals

A complete exercise program should include warm-up preparation before exercise, physical exercises, and relaxation and stretching after exercise. Figure 6 shows the operation process of home exercise for children with mental retardation. The children according to their own psychological needs from the movement exercise resources chose the corresponding exercise contents, including warm-up exercises, body exercises, and relaxation exercises. The function of each movement exercise is not unique, so the same movement exercise can be repeated in different exercise modules to meet different mental goals. After three rounds of expert screening, the warm-up module finally retained 22 exercises; In the physical exercise module, 135 exercises were retained, including 73 exercises for structural improvement of physical function, 18 exercises for sports interest, 14 exercises for psychological satisfaction, 17 exercises for excitement and inhibition balance, and 13 exercises for self-control. The relaxation stretch module ultimately retains 21 exercises.

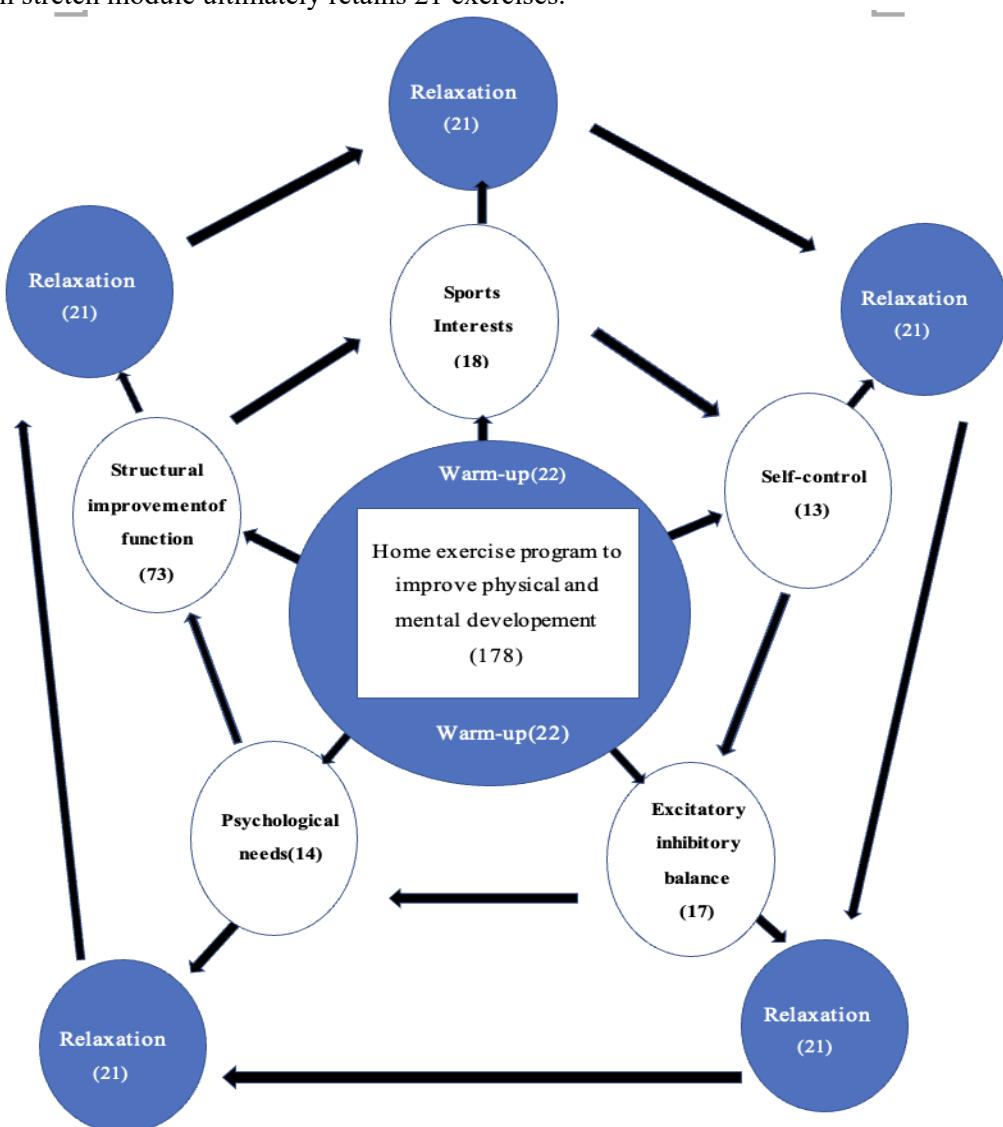


Figure 6 An operational for home-based exercise programs for meeting different psychological needs

A successful home exercise program should be diverse, individualized, focused on mental health, provide clear guidance and support, sustainable, monitorable, and evaluable. The practice process found



that children with mental retardation were able to understand the movement exercises explained by the teacher and could complete them alone under the teacher's guidance. At the same time, the children with mental retardation did not show any signs of burnout or loss of interest in the exercise process, indicating that the program provides a variety of exercise forms that can meet the needs of children with different psychological needs and that the program's movement design is reasonable, realizing the purpose of "once you say it you understand it, once you learn it you will know it, and once you practice it you will be able to achieve it". The good results and sustainability of the exercises make it more likely that they will continue and benefit from them for the rest of their lives.

The content system of family physical exercises provided a convenient and effective way for children with mental retardation to seek a healthy lifestyle. The program started from the individual, interpersonal, and community levels, highlighting the central position of children with mental retardation, grasping the improvement of support and health configuration at the interpersonal level, focusing on the forms of interaction and environmental maintenance at the community level, and promoting the desire of children with mental retardation to exercise through environmental changes to establish the habit of mental exercise needs. The program skillfully combines professionalism and practicality, making it possible for children with different needs to exercise in the comfort of their own homes. It was designed to cater to different physical conditions and fitness goals, ensuring that everyone can find the right speed and type of exercise for them. Through this program, children with mental retardation cannot only enjoy a tailor-made exercise program but also receive continuous motivation and support through interaction and innovation, making health and vitality a goal within reach for every family with a child with special needs.

## Recommendation

### Practices Recommendation

1. The constructed socio-ecological model of home-based physical exercises for children with mental retardation needs to be extended and expanded.
2. Continue to increase and enhance the quantity and quality of physical exercise content.
3. Practice tests should involve more children with mental retardation.
4. The methods of measurement and evaluation should be diversified.

### Recommendation for Future Research

1. The use of ecological models for home exercise will vary according to the structure of the household and further in-depth refinement of the study is needed.
2. Research results must be put into practice to benefit more children with mental retardation.

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