

Official Research Journal of the American Society of Exercise Physiologists

ISSN 1097-9751

Journal of Exercise Physiologyonline

August 2023 Volume 26 Number 4

JEPonline

2-Minute Kra Dot Yang Test: A New Field-Based Testing of Cardiorespiratory Fitness for Children Aged 10 to 12 Years

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ABSTRACT

Tongterm T, Chimphali K, Kaewma J, Thanatrai W, Sukdee N. 2-Minute Kra Dot Yang Test: A New Field-Based Testing of Cardiorespiratory Fitness for Children Aged 10 to 12 Years. JEPonline 2023;26(4):117-132. The objective of this study was to design and develop a field-based test to assess cardiorespiratory fitness in children aged 10 to 12 years, using Thai folk games. A research and development model, along with a cross-sectional study design, was employed field-based in three steps. Firstly, а cardiorespiratory fitness test using a Thai traditional game, rubber jumping, was developed for children aged 10 to 12 years. A sample of 35 children participated, and content validity was assessed by five experts. Secondly, the quality of the test items was evaluated using a sample of 60 children aged 10 to 12 years. Concurrent validity was determined by establishing the correlation coefficient between the results of the 2-Minute Kra Dot Yang Test developed by the research team and the results of the 600-Yard Run/Walk Test, with statistical significance set at 0.01. Evaluator reliability was assessed by retesting participants after a one-week interval using the intra-class correlation coefficient (ICC) model. The ICC (3, 1) estimates the inter-observer reliability by finding the

intra-class correlation coefficient from the ICC model (3, K). Thirdly, normative scores for the test items were established by the research team, considering sex and age variables, based on a sample of 600 children aged between 10 and 12 years. Normative score tables were constructed using percentiles. The findings revealed that the 2-Minute Kra Dot Yang Test demonstrated high content validity (IOC = 1) and concurrent validity (r = -0.79, P < 0.01), good intra-rater reliability (r = 0.79, ICC: 0.61-0.88), and very good inter-rater reliability (r = 0.90, ICC: 0.84-0.94). Furthermore, a physical fitness norm for children was established based on the 2-Minute Kra Dot Yang Test, categorized by gender (male or female) and age groups (10, 11, and 12 years old). The study concludes that the developed 2-Minute Kra Dot Yang Test program exhibited academic correctness, ease of use, availability of measuring equipment, safety in testing, and the ability to encourage children to participate in the test.

Key Words: Children, Norms, Physical Fitness, Physical Fitness Test, Thai Folk Games

INTRODUCTION

Physical fitness is important to strengthen people's health so they can perform various tasks in their daily routine and live their lives efficiently. It also contributes to both mental and emotional development. When it comes to physical fitness tests, many people think of cardiorespiratory fitness (CRF) at first because CRF is considered an important physical fitness component that indicates good health in all age groups. CRF, or aerobic fitness, is the ability of the circulatory and respiratory systems to transport oxygen to the skeletal muscle mitochondria in order to produce energy needed during daily activities or physical activity (5,26). In addition to CRF, some textbooks may use the term cardiovascular endurance. The low levels of CRF are an indication of cardiovascular risk to cardiovascular disease (CVD) and adult mortality (26). Among children and young people, CRF can also be used as a predictor of health status (17) for instance; risk for cardiometabolic syndrome (23), premature CVD (12), and cognitive health (25) of which good mental health (18,23) can also predict academic achievement (30). However, not many people have a positive and/or appropriate attitude about having good CRF. Children in both the United States and many other countries have low CRF, which is no doubt a function of sedentary behavior, obesity, and socioeconomic changes (8,9,34,35). In Thailand, it was found that during the COVID-19 epidemic, only 27% of Thai children and youth met the 60-minute daily physical activity threshold (39).

The evaluation of CRF can be divided into laboratory tests with cycling or a treadmill and field-based testing. For laboratory testing, measuring maximum oxygen consumption or VO₂ max is the accepted standard for evaluating CRF (3). However, that method is used for high precision or in hospitals with specialized treatment for cardiovascular, pulmonary, and vascular diseases only because it requires high-tech and expensive equipment. Therefore, it is considered a limitation of laboratory testing. As for health promotion, especially among children and youth, it was found that field-based testing is preferable because it requires fast measurement results and can be used to test many children at the same time. In other countries, there are tests to assess CRF among children and youth, such as the 600-Yard Run/Walk Test (1), the PACER Fitness Test (Beep Test) (23), the Half-Mile Run/Walk (37), 1 Mile Run/Walk (10), 1,000-Meter Run/walk (6), the Cooper 12-Minute Run (7), the Cooper 9-Minute Run (28), 1.5-Mile Run/Walk, 1,500-Meter Run/Walk, 6-Minute Run/Walk (19), and the 3-Minute Step Test (2). According to these tests, it shows that the most popular form

of activity used for testing is walking or running, and it is measured by duration time or the distance that can be practiced in accordance with the time requirements in the test item. The 6-Minute Run/Walk Test is considered a field test that is very popular in both medical services, physical therapy, and clinical research (2,15).

Nevertheless, when applying tests from abroad in Thailand's context, there may be some limitations in terms of the different physiology between Thais and foreigners. It is necessary to consider several factors, such as the height of the practice, length of practice, and distance in practice. In the past, many Thai scholars and related organizations have proposed a list of tests to assess CRF for Thai children and youth. For example, Samahito (29) proposed to use the 1,000-Meter Run/Walk Test in the KASETSART Youth Fitness Test, and the Department of Physical Education, Ministry of Tourism and Sports of Thailand, has proposed the use of a long-distance test program in the physical fitness test of Thai children and youth for children aged 7 to 12, run 1,200-meter run, and for children aged 13 to 18, run 1,200-meter run in both males and females (20), and in the year 2019 until now, the authority has proposed the use of the following test items, 3 minutes of stepping up and down replaces the long-distance running test program proposed in 2019 (21). There are also other authorities at the national level, such as the Thai Health Promotion Foundation and the Department of Health, Ministry of Public Health that have proposed a physical fitness test for children and Thai people. It was found that the proposed CRF test also used long-distance walking and running patterns (22,33).

Thai folk games are a type of recreational activity that is accepted in Thai society that is rooted in the reality of the community's way of life. There is a practice inherited from the past to the present. The aim is to create fun and enjoyment on various occasions by participating in folk games that encourage children to socialize with friends of the same age, practice social skills, encourages children to have a healthy body, stimulates the nervous system in different parts of the body, practice using the hands in relation to the eye muscles, muscle strength training, encourage children to be creative and practice being a good leader and follower. In other words, Thai folk games provide physical, mental, emotional, social, and intellectual values (4,14,24,32,36). However, the research team found that in the past there is no study on creating a physical fitness test for children using Thai folk play activities although there are many Thai scholars who are interested in studying Thai folk games.

Therefore, in the present study, the researchers aimed to design and develop a field-based test to assess cardiorespiratory fitness in children aged 10 to 12 years, using Thai folk games. The research team expects that sports scientists, physical education teachers, and personnel involved in health promotion for Thai children and youth will be able to use the test items developed by the research team as a tool for measuring and evaluating health outcomes for Thai children and youth in the future.

METHODS

Subjects

Design and development of a field-based cardiorespiratory fitness test of a sample group of children between 10 and 12 years of age, using the form of Thai traditional game, rubber jumping. Five experts were used to assess the validity of the content. The sample consisted of 60 children aged 10 to 12 years. To create a normative score of the test items developed

by the research team separated by sex and age variables The samples were 600 children between 10 and 12 years of age. This study received approval from the Research Ethics Review Committee of Faculty of Liberal Arts and Science, Sisaket Rajabhat University on March 31, 2021. Informed consent was obtained from all participants.

PROCEDURES

This article is a research and development (R & D) project in cooperation with the cross-sectional study, of which there are 3 steps for the research methods.

Step 1. The Process of Design and Developing the Cardiorespiratory Endurance Test. During the design stage, the research team developed a method to assess cardiorespiratory endurance in children aged 10 to 12 years old using the Thai folk game, Kra Dot Yang, as the basis for designing the test (14). The team followed six design principles: 1) The test items must have both validity and reliability that can estimate the level of cardiorespiratory endurance in the children aged 10 to 12 years old. 2) Easy to use. 3) Be able to test both in the laboratory and filed test with the same standard. 4) Must be challenging, fun, and stimulating to the participants. 5) Safe to test. 6) Economical, the test equipment must be easy to buy at a low cost. The research team conducted a pilot study with a group of 10 to 12-year-old children, including 5 participants (2 boys and 3 girls), to test the feasibility of the developed test items.

In the development stage, the research team used the findings from the design process to refine and improve the test items. The team conducted a pilot test with a group of 30 children aged 10 to 12 years (15 boys and 15 girls) over three rounds to ensure validity, reliability, objectivity, appropriate difficulty for the target age group, and safety. The research team then sought content validity by involving five experts in sports science and physical education who evaluated the developed test items using the index of concordance (IOC) (27).

Step 2. The Process of Evaluating Quality.

In the process of evaluating the quality of this test item, the research team used the developed test items to test 60 students 10 to 12 years of age at Ban Som Poi School (Som Poi Wittayasarm), Rasisalai District, Sisaket province. The sample size was calculated by STATA version 10, and variables were set as follows: (P1) = 0.85, Null Value (P0) = 0.50, Number of Replicates = 3, Alpha Level = 0.05, Power = 0.80, which can calculate the sample size of 10 people, but according to this study which wants to test the quality of the test items in children of 3 age groups and divide into boy and girl, therefore, at this stage, the research team collected data for a total of 60 people from 6 groups, as follows: 1) 10 boys from 10-year-old children; 2) 10 girls from 10-year-old children; 3) 10 boys from 11-year-old children; 4) 10 girls from 11-year-old children; 5) 10 boys from 12-year-old children; and 6) 10 girls from 12-year-old children. The sample group selection method was voluntary and in addition to the age criteria, there was another criterion for selection in the study. There was no doctor's diagnosis that exercise was prohibited, know the objectives and consent to participate and parents consented and allowed to participate in the research project. The process of evaluating the quality of this test items are as follows:

1. Finding the concurrent validity by analyzing the relationship between the results of the cardiorespiratory endurance test for standard children, which is the test result with the

600-yard run walk test item (13), and the test items developed by the researchers using the same administrator. The correlation data of test results were analyzed with Pearson Product Moment Correlation Coefficient statistics at the significance level of 0.01, and the conditional validity was evaluated according to the criteria of Hinkle et al. (2003). The criteria were as follows: very low level (r = 0.20), low level (r = 0.20-0.39), moderate level (r = 0.40-0.59), high level (r = 0.60-0.79), and very high level (r = 0.80-1.00).

2. Finding the Reliability by Using the Intraclass Correlation Coefficient (ICC) Method that Consists of: (a) Finding intra-rater reliability by the test-retest reliability method, using the same test administrator. Test with a test item developed by the research team during the 7-day interval (the test was conducted in the morning hours between 9:00 and 12:00). The data were analyzed by bringing the results of two times test to find the intra-class correlation coefficient by the Shrout & Fleiss (31) derived from the ICC model (3.1), using the two-way mixed-effects model, and using the definition model of the coefficients. The intra-class correlation is absolute agreement, and the correlation size is presented at 95% confidence interval (95%CI); and (b) Finding inter-rater reliability, which may be called objectivity by using two test administrators. Tested items developed by the research team. The first assessor conducted the morning test from 9.00 to 12.00 am, and the second assessor conducted the afternoon test from 1.00 to 4.00 pm on the same day. The data were analyzed by using the results of two times test to find the intra-class correlation coefficient by the Shrout & Fleiss (31) derived from the ICC model (3,1), using the two-way mixed-effects model, and using the definition model of the coefficients. The intra-class correlation is absolute agreement, and the correlation size is presented at 95%CI and evaluated at the level of reliability by using the evaluation criteria for the intra-level correlation coefficient of Koo & Li (16), which have the following criteria: low level (r = 0.00 to 0.49), fair level (r = 0.50to 0.74), good level (r = 0.75 to 0.89), and very good level (r = 0.90 to 1.00).

Step 3. The Process of Creating Normative Scores.

This process was a cross-sectional study. The researchers set the sample size to create normative scores by opening the table of Taro Yamane (38), which found that when there is an unlimited population size (∞) at a 95% of reliability and the static error at ±5, a minimum sample size of 400 people should be used to prevent data loss and increase the reliability of the database. Therefore, the research team has increased the sample size 50% (200 people) of the sample size obtained from the table. Therefore, this study used a total sample size of 600 people using volunteers from children aged 10 to 12 years to participate in the research project as quota selection from elementary schools in the area of Mueang Sisaket District. Sisaket Province. There are 10 schools with 60 students per school. Each school consists of 6 age groups as follows: (a) 10 boys from 10-year-old children; (b) 10 girls from 10-year-old children; (c) 10 boys from 11-year-old children; (d) 10 girls from 11-year-old children; (e) 10 boys from 12-year-old children; and (f) 10 girls from 12-year-old children. The sample group selection method is voluntary and in addition to the age criteria, there is another criterion for selection in the study, that is, there is no doctor's diagnosis that exercise is prohibited, know the objectives and consent to participate and parents consented and allowed to participate in the research project. After collecting complete data, the research team analyzed the data and used the data to create a benchmark by finding the percentile value and a normalized table of physical fitness was categorized into 5 levels as follows: very low (< 10th percentile), low (10th to 24th percentile), moderate (25th to 74th percentile), good (75th to 89th percentile), and very good level (90th to 100th percentile).

RESULTS

1. Design and Development Results

From the conducted research with the R & D method, the research team obtained 1 test item for the evaluation of the children aged 10 to 12 years, namely, the 2-Minute Kra Dot Yang Test that has an Index of Concordance (IOC) at 1 and the details of the test items are as follows:

2-Minute Kra Dot Yang Test



Test Method:

1) Prepare testing equipment as shown in Figure 2.

2) Test taker prepared in a standing position on the side of jumping height line and the height from ground to knee patella for each student (the height of jumping is different for each student.) by setting the jumping height equal to the patellar height of the test taker, as shown in Figure 2.



Figure 2. Test Administrator Determines the Height of Jumping.

3) When hearing "Start" signal from the test administrator, test taker jumps over the set height line (long rubber braid) back-and-forth two sides without touching the set line, which is a reference level. Continue jumping for 2 minutes as many times as possible according to the ability of the individual, as shown in Figures 3a–3f, the test taker can stop for a while and continue jumping until reaching 2 minutes according to their abilities.



Recording of Test Results and Evaluation:

The test result was recorded as the number of times the test taker was able to jump over the reference point (rubber braid) within 2 minutes, counting only the number of times that the jump and did not touch the reference point. Allow the test taker to test only once and compared the obtained values with the normative scores criteria created by the research team.

Recommendations to Apply:

- 1) The test administrator should demonstrate and allow the test takers to practice before taking the actual test.
- 2) In evaluating the test results according to the test standards developed by the research team, the number of times the test taker fails to jump over the reference point will not be counted. But in the application to use, the test administrator may count the number of times the test taker is able to jump over the reference point but still not touch the reference point. This is to compare the development gained from participating in various physical training programs.
- 3) Although this test is safe for children, The researchers agreed that the test administrator should be close to the test taker. This is to prevent injury and to provide urgent assistance to the test taker in the event of an emergency, such as tripping, falling, or feeling dizzy.

2. Quality Evaluation Results

To evaluate the quality of the 2-Minute Kra Dot Yang Test developed by the researchers in this study. There were 60 people in the sample, which were equal numbers of gender; 50%. The samples were 10 years old, 11 years old, and 12 years old, approximate about 33.33% the same in all three age groups. The most proportion of the body weight is in the range of 30.1 to 40 kilograms, which is 38.33%, the most proportion of the height is in the range of 140.1 to 150 centimeters, which is 48.34%, and the most proportion of body mass index is less than 18.5 kilograms per square meter, which is 53.33%. The research team was able to present the individual information of the sample, as shown in Table 1, and the concurrent validity, intra-rater reliability, and inter-rater reliability data are shown in Tables 2 to 4.

Table 1. Descriptive Statistics of Individual Information in the Sample (n = 60). Individual Information Min

Individual Information	Mean	± SD	Min	Max
Age (year)	10.95	0.89	10.00	12.00
Weight (kilogram)	42.91	13.34	21.00	89.70
Height (centimeter)	146.52	9.56	123.00	170.00
Body Mass Index (kg·m ⁻²)	19.71	4.64	13.20	31.00

Test	Test	results	Correlation	Concurrent Validity	
	Mean	± SD	Coefficient (r)		
600 Yard run walk (minute)	3.73	0.74	-0.79*	high	
2-Minute Kra Dot Yang Test (time)	27.83	7.09			

Table 2. The Result of Concurrent Validity of the 2-Minute Kra Dot Yang Test (n = 60).

*P < 0.01

Table 3. The Result of Intra-Rater Reliability with the Test-Retest Method by Finding the Intraclass Correlation Coefficient Derived from the ICC Model (3,1) (n = 60).

2-Minute	Test R	esults	Intraclass Correlation	05% CI	Intra-Rater Reliability	
Kra Dot Yang Test	Mean	± SD	Coefficient: ICC _(3,1)	33/001		
Test	27.83	7.09	0.79	0.61 - 0.88	good	
Retest	29.83	6.78				

Table 4. The Result of Inter-Rater Reliability by Finding the Intraclass Correlation Coefficient Derived from the ICC Model (3,K) (n = 60).

2-Minute Kra Dot Yang Test	Test Results Mean ± SD		Intraclass Correlation Coefficient: ICC _(3,k)	95%CI	Inter-Rater Reliability
Rater A	27.83	7.09	0.90	0.84 - 0.94	Very good
Rater B	27.37	6.82			

3. The Result of Normative Scores of 2-Minute Kra Dot Yang Test

The creation of normative scores of 2-Minute Kra Dot Yang Test in this study was done with 600 people in the sample group; 10 years old, 11 years old, and 12 years old, approximate about 33.33% the same in the 3 age groups. The most proportion of the body weight is in the range of 30.1 - 40 kilograms, which is 38.33%, the most proportion of the height is in the range of 140.1 - 150 centimeters which is 48.34% and the most proportion of body mass index is less than 18.5 kilograms per square meter which is 53.33%. The research team was able to present the individual information of the sample, as shown in Table 5. The mean and standard deviation of the results of the 2-Minute Kra Dot Yang Test are shown in Table 6 and the normative score criteria for the 2-Minute Kra Dot Yang Test separated by gender and age are shown in Table 7.

Individual Information	Mean	± SD	Min	Мах
Male (n = 300)				
Age (year)	11.00	0.82	10.00	12.00
Weight (kilogram)	42.28	13.43	18.30	88.70
Height (centimetre)	145.02	9.73	118.00	171.00
Body Mass Index (kg·m ⁻²)	19.80	4.99	12.20	36.20
Female (n = 300)				
Age (year)	11.00	0.82	10.00	12.00
Weight (kilogram)	41.95	12.08	21.00	82.70
Height (centimetre)	146.91	9.23	123.00	170.00
Body Mass Index (kg·m ⁻²)	19.20	4.41	11.10	32.71

Table 5. Descriptive Statistics of Individual Information in the Sample (n = 600).

Table 6. Mean and Standard Deviation of the Results of the 2-Minute Kra Dot Yang Test of the Sample (n = 600).

Gender	10 Yea	rs Old	11 Yea	ars Old	12 Yea	rs Old	То	tal	Min	Mox
Ciliaci	Mean	± SD	Mean	± SD	Mean	± SD	Mean	± SD	IVIIII	Max
Male	30.55	8.99	34.62	9.92	35.64	10.79	33.60	9.90	14.00	59.00
Female	30.01	8.75	32.68	9.35	32.42	9.35	31.70	9.15	14.00	58.00

Table 7. Standard Criteria of the 2-Minute Kra Dot Yang Test (n = 600).

	Standard Criteria (Time)							
Age Ver Lov (P < 1		Low (P10 - P24)	Moderate (P25 - P74)	Good (P75 - P89)	Very Good (P ≥ 90)			
Male								
10 years old (n = 100)	19 below	20 – 23	24 – 34	35 – 41	42 above			
11 years old (n = 100)	21 below	22 – 28	27 – 40	41 – 48	49 above			
12 years old (n = 100)	21 below	22 – 27	28 – 43	44 – 50	51 above			
Female								
10 years old (n = 100)	19 below	20 – 22	23 – 33	34 – 41	42 above			
11 years old $(n = 100)$	20 below	21 – 26	27 – 37	38 – 45	46 above			
12 years old $(n = 100)$	19 below	20 – 24	25 – 37	38 – 43	44 above			

DISCUSSION

The 2-Minute Kra Dot Yang Test developed by the research team demonstrated content validity as assessed by the consensus of 5 experts in sports science and physical education. This indicates that the test program developed by the researchers effectively assesses the cardiorespiratory endurance of children aged 10 to 12 years, aligning with the researchers' objectives. It can be used in the field and suitable for testing among children 10 to 12 years of

age. In the experiment to evaluate the quality of the test items, it was found that the 2-Minute Kra Dot Yang Test had concurrent validity at the high level (r = -0.79) when compared to the evaluation criteria of Hinkle et al. (11), the intra-rater reliability is at a good level (r = 0.79) when compared to the evaluation criteria of Koo & Li (16), and the inter-rater reliability is at a very good level (r = 0.90) when compared to the evaluation criteria of Koo & Li (16). These results may be due to Thai folk game, given that Kra Dot Yang has been very popular in rural Thailand until now. Due to the availability of cheap equipment (rubber braid), many children in rural areas can play together at a time. Today, this type of game is still found in rural communities in Thailand.

In the present research, the sample group of children used in the design and development (R & D) stage had experience with this game. The reason for the high inter-rater reliability may be due to the children's experience in performing the above-mentioned activities. Therefore, despite using different test administer, children can perform the test with the same standards. It was also found that due to the 2-Minute Kra Dot Yang Test method developed by the research team, the test item is easy to understand and follow. The only condition of the test is that the children must try to jump over the reference point (rubber braid) as many times as possible without letting their body touch the reference point. For the test administrator, it was not complicated, but rather the test can be easily understood as to how to measure and evaluate. This point may have helped in finding that the intra-rater reliability and inter-rater reliability in this study had a good and very good levels (r = 0.79 and r = 0.90, respectively).

The high concurrent validity found to be at a high level (r = -0.79, P .01) may be due to the 600-Yard Run/Walk Test used by the research team as a standard test item in this research. It is a test that evaluates the amount of time the children can perform. The children can run and show good running skills, although it takes a little time to test. It is also necessary to have other physical fitness components associated with good CRF, such as the strength and endurance of the leg muscles, the power of leg muscle and good balance, so that the children will show good running skills. This is consistent with the practice of the 2-Minute Kra Dot Yang Test developed by the research team because children will have to try to jump over the reference point (rubber braid). The children who perform not only needed good CRF, but they also need strength, power, and endurance of the leg muscles to perform the activities continuously for the duration of 2 minutes without falling during the test.

As the researchers expected, the test results are inversely related, i.e., the children who were able to test the 600-Yard Run or Walk in a short period of time (fast running) were able to perform the 2-Minute Kra Dot Yang Test at a high number of times. So, it can be concluded that the test items developed by the research team not only to evaluate CRF in 10 to 12-year-olds, the test also shows the level of competency in muscular strength and endurance of the lower limbs as well as the dynamic balance of the children who were tested is considered a great advantage of this test item. That is, it is a single test, but it can assess a child's physical fitness in several components. This is consistent with the principles of physical fitness test development for children (29).

Children will have limited interest in activities. Therefore, if any test activity requires too much testing time or has complicated procedures, children often do not cooperate or become bored during the test and eventually do not want to participate. This will affect children's attitudes

towards participating in physical fitness tests in the future. Therefore, a good physical fitness test should be able to assess the necessary competencies for the daily lives of children and the 2-Minute Kra Dot Yang Test has qualifications for this item as the research team has already discussed.

In addition to the fact that the 2-Minute Kra Dot Yang Test that the research team developed is academically accurate and easy to use, it was also found that the test was easy to find the equipment and it is safe to test in children 10 to 12 years of age. The main equipment used in the test is only the rubber braid and 2 stable upright poles. The price of the rubber braid being invented is only ten digits Baht, and it is generally available in Thailand because it is a popular product used in the daily lives of Thai people who use it to tie food bags or various beverage bags (as in Figure 1a). The two stable upright poles are invented from Poly Vinyl Chloride (PVC) and the base is made of cement cast in a water tank. (As shown in Figure 1c). Also, in addition to the equipment the researchers invented for those who want to use this test, other materials can be used as well. For example, straw rope can be used as a reference point instead of a rubber braid, and the test administrator can be the person holding the reference point instead of the poles. But from the experimental results of this study, it was found that using rubber braid has many advantages over using straw rope or other types of rope. If the children who takes the test hits or jumps over but touches the rubber braid, it is not easy to break compared to other materials because it is very flexible. It also reduces the children fear of jumping because the children will feel that hitting the rubber braid during the jump can be done without being injured. If it is any other material, the children will be afraid to jump over it because they were afraid of getting hurt if they could not make the jump.

The final point discussed by the researchers in this study is that the 2-Minute Kra Dot Yang Test can motivate children to participate in the test. The children tend to enjoy doing activities with friends of the same age, even if it is a physical fitness test. From the results of the experiment, it was found that if the children took part in any test with their friends, they would be especially interested in participating in the activity and if any test program is organized in a competitive test, children are also likely to test with their highest potential. This corresponds to the principles of general physical fitness testing that the test administrator arranges for the test to know the true potential under the safety of the test taker in each aspect. The 2-Minute Kra Dot Yang Test is a test item that is easy to find equipment.

Also, if the administrator arranges the test for children of the same or similar height into groups, each group may be 2 to 3, and the children may take part in the test at the same time. Organizing one testing station as before but stretching the rubber braid to be longer, that is, increasing the distance of the testing field. This method can be used to help counting the results by the administrator of 1 person per 1 to 2 children (using counting equipment), or the administrator may use the method of adding testing stations because each testing station has a very affordable price by using 1 administrator for 1 child. It is possible for children to take part in the test at the same time with their friends and to make them feel competitive with their friends, which is a stimulating way of testing fitness. The research team recommends this method to organize testing stations in communities or schools with a high number of children participating in physical fitness testing activities.

CONCLUSIONS

The 2-Minute Kra Dot Yang Test developed by the researchers can be used to evaluate the level of cardiorespiratory fitness of children aged 10 to 12 years old. The test is academically accurate. It has good validity, reliability, and objectivity for testing. The test items are easy to use, easy to find the equipment, safe for testing in children, and it encourages children to participate in the test. The research team also created a standardized test item, the 2-Minute Kra Dot Yang Test, separated by gender and age to facilitate those who want to use this test item.

ACKNOWLEDGMENTS

Thank you, Research and Development Institute, Sisaket Rajabhat University for supporting research funding for the fiscal year 2022 for the research team.

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