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UMAC-CPF Coordination Test Model for Predicting the Eye, Hand, and Foot Coordination Ability of CP Football Players

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Abstract Cerebral palsy (CP) is a brain disorder experienced by a person, which results in experiencing many disturbances in motor activities. Impaired motor coordination in people with CP is immediately apparent when observed. The coordination ability of players is needed in activities during playing football. Adequate instruments are necessary to measure the special coordination abilities of cerebral palsy (CP) football players. This study aimed to produce an instrument test model to measure the special coordination abilities of people with cerebral palsy. The research method was research and development using quantitative and qualitative approaches. The respondents were people with cerebral palsy who met the CP football classification requirements according to the International Federation of Cerebral Palsy Football (IFCPF) regulations. Data analysis used the SPSS statistical software. The study resulted in a valid and reliable test instrument for eye, hand, and foot coordination for cerebral palsy football players. The norms for the Eye-Hand and Foot Coordination Ability test of the Cerebral Palsy football players were in the Excellent category (Point 5) if the score was ≥ 29, Good (Point 4) for the score of 19-28, Moderate (Point 3) for the score of 10-18, Deficient (Point 2) for the score of 5-9, and Immoderate (Point 1) if the score was ≤ 4. The eye, hand, and foot coordination test instrument was mainly for the CP football players, which can also be used by athletes, coaches, and educators. This instrument was named Umar Motor Ability Circuit-Cerebral Palsy Football (UMAC-CPF) Coordination Test Model.

Keywords Cerebral Palsy, Coordination Test, Eye-Hand-Foot Coordination, CP Football

1. Introduction

Fostering disability sports achievements is essential for the interests of a country. The National Paralympic Committee (NPC) of Indonesia is a forum for sports organizations with disabilities in Indonesia that need government support in coaching and developing achievements. Maximum achievements in various sports with disabilities must be pursued to make the Indonesian nation proud. Disability is a condition of a person who lacks in carrying out routine activities [1]. Persons with disabilities have limitations in activities and limited

movement. Disability can be influenced by physical fitness related to health [2].

One of the developments for disability sports achievements carried out by the NPC of Indonesia is the Cerebral Palsy Football branch. Cerebral Palsy Football (CPF) is a football game designated for people with cerebral palsy (CP) disabilities. People can play CPF with disabilities with athetosis, ataxia, and physical impairment [3]. Cerebral Palsy Football has rules with some modifications from FIFA that are adapted to the needs of people with disabilities [4], [5]. Cerebral Palsy Football is expected to be a place to explore the self-confidence of children with disabilities from their limitations [6].

People with cerebral palsy have motor problems. A person with cerebral palsy will be delayed in achieving motor skills more than an average person. Poor motor conditions can be affected by damage to the myelin sheath in the brain and spinal cord. This disorder can affect people's control and coordination functions with cerebral palsy. In addition, disabled players have physical impairments such as running, heading, and kicking the ball. Therefore, CP players need to get a training model to maximize physical function in football [7].

Modified rules apply to all CPF tournaments [8]. Each prospective player in the tournament must meet the criteria for the CP football competition under the IFCPF rules [9]. Classification is the entry point for any sport, so the athletes who play are selected according to the rules. Athletes must qualify for the cerebral palsy class based on the competition classification system. Paralympics is a sport that competed by people with health problems and disabilities [4]. The classification of players in sports with disabilities is intended for the competition to run well [10]. Classification in the game is not only based on neurological disorders to guarantee a match [11]. Body systems and structures are components of the classification of conditions for disabled players to compete [12]. Players with disabilities are judged on physiological function and playing skills.

Cerebral palsy football players must have reasonable motor skills in the game. Individuals or their activities are influenced by their motor skills [13]. Children with CP disorder will have balance and motor development problems [14], [15]. Yet, the CP players' motor skills measurements may detect their abilities. This measurement of motor ability is done by measuring physical ability first [16]. The components of physical ability measured included speed, agility, strength, coordination, and balance. Good physical ability is expected to improve the playing skill of CP football players. Various evaluation instruments are needed to determine cerebral palsy football players' increasing physical and technical skills. One of the instruments necessary is a test tool for eye, hand, and foot coordination.

The eye, hand, and foot coordination test is a test that aims to observe a person's ability to align the eyes, hands, and feet into regular, comprehensive, and controlled movements. Good coordination skills are needed in football to carry out basic and advanced actions, such as dribbling, passing, shooting, and passing opponents [17]. However, a suitable test instrument has not been found to detect CP Football players' eye, hand, and foot coordination ability. Cerebral palsy athletes have limited body and motor skills. These limitations make it challenging to coordinate various movements in cerebral palsy football [18]. Therefore, athletes with cerebral palsy disabilities require special coordination test instruments.

Based on the existing conditions, it is necessary to design a model of the eye, hand, and foot coordination test instrument according to the requirements of CP football athletes. What is the model of the test kit to measure eye, hand, and foot coordination for cerebral palsy football players? What is the standard for eye, hand, and foot coordination tests for cerebral palsy football players? This research needs to find an exceptional eye, hand, and foot coordination test model for CP football players.

2. Materials and Methods

The research method was research and development using quantitative and qualitative approaches. A qualitative approach was used to extract information about the evaluation of CP football results at the Indonesian NPC and focused discussions with a team of experts in selecting test designs. In contrast, a quantitative approach was used to test the item feasibility using statistical tests. The data analysis process is assisted by SPSS statistical software.

The respondents used were cerebral palsy athletes who met the CP football classification requirements according to the International Federation of Cerebral Palsy Football (IFCPF) regulations. The IFCPF Classification Rulebook states that athletes who can participate in CP football are at least those who have ataxia, hypertonia, or athetosis disorders [9]. The three types of infections are related to movement control disturbances centered on the brain, causing permanent troubles and limited movement abilities [19]. Therefore, the selected athlete has at least one of these disorders.

The procedure for preparing instruments for cerebral palsy athletes requires specific steps [2]. These steps are (1) Analyzing games, physical conditions, and skill techniques to determine the factors to be measured, (2) Selecting the type of test used to measure, (3) Developing tests, administration, and test assessment methods, (4) Testing trials to determine the validity and reliability of the test, (5) Revising or improving test items, (6) Developing test norms. These steps were carried out in the following research stages:

2.1. Analyzing the Needs of the Eye, Hand, and Foot Coordination Components and Types of Tests

The step taken at this stage was to analyze the

components of the eye, hand, and foot coordination of football players needed in actual football matches and training and to analyze the types of coordination tests that can be used to measure the coordination components of football players. Cerebral palsy football players need coordination of eyes, hands, and feet in competing and training. Then, determine the types of coordination tests and their development to measure the required components.

2.2. Selecting Types of Coordination Tests

The framework of the types of coordination tests identified and the development of existing tests at the subsequent analysis stage are selected. This step was carried out to get the kinds of coordination tests following the needs of CP football players in carrying out matches and training. The process of selecting coordination tests to be used in a series of CP football tests was through expert studies (field experts) in the Discussion Forum.

2.3. Developing Types of Tests

The steps taken at the test development stage were to design techniques or procedures or tools used to measure the components of the physical condition of CP football players according to experts' input in the Discussion Forum so that the types of tests expected were selected and arranged.

2.4. First Trial (Small Scale) and Data Analysis

The sampling technique was purposive sampling, in which the subject was determined based on the technical feasibility qualifications. The implementation steps for this pilot were planned as follows: socializing the implementation instructions for the types of coordination tests that have been developed and would be implemented to the parties involved; carrying out trials of the kinds of coordination tests that have been developed; recording all the results of the first test trial; analyzing and interpreting data.

Table 1. Guidelines for providing an interpretation of correlation coefficients

Coefficient interval	Relationship level
0,00 – 0,199	Very low
0,20 – 0,399	Low
0,40 – 0,599	Adequate
0,60 – 0,799	Strong
0,80 – 1,000	Very strong

The test-retest method was used to test the reliability, and the statistical test used the bivariate correlation of Pearson (Pearson Product Moment). The standard reliability test used the comparison between the probability value (p) with a significance level of 0.05. If $p < 0.05$, then this type of test has significant reliability, and if $p > 0.05$, the opposite occurs. Reliability testing can be seen in the calculation of the guidelines for interpreting the correlation coefficient in Table 1 [20].

2.5. Revising Instruments

The trial process revealed some of the shortcomings of the test instrument. Input came from test-takers or experts who accompanied the trial process. This stage produced better instruments than before.

2.6. Forming Norms or Standard Scoring

The purpose of this stage was to convert the results achieved by players in carrying out a series of types of physical tests. The preparation of scoring norms was done by using the following formula:

$$Ki = \frac{R}{I} + 1 \Rightarrow I = \frac{R}{Ki-1} \quad (1)$$

Annotation

I = Interval

R = Range (the difference between the highest score and the lowest score)

Ki= Interval class

4. Result and Discussion

CP football is an open-loop sport that requires high decision-making, response, organization, spatial awareness, and various psychological, physical, and technical abilities [21]. In this sport, athletes who can participate are divided into several categories depending on how much their performance declines in the sport. CP Football includes four classes for athletes who can participate in the match: FT1, FT2, and FT3.

The FT1 category is the category of players who have the most body coordination problems. In this category, athletes have hypertonia or spasms in both lower and upper limbs. Players have difficulty walking, turning, and stopping due to limited activity in the lower limbs [22]. In addition, athletes in the FT1 category are affected by coordination and balance problems in all four limbs and torso. FT1 players usually have difficulty dribbling the ball when walking, accelerating, and stopping. Class FT2 is a category for hemiplegic players, referring to those whose only one side of their body is affected, causing them to walk and run with a limp. In addition to these disorders, athletes may have balance problems, so their feet are often disturbed when used to shoot the ball. The last class is FT3, a class for athletes with the mildest motor impairment. Athletes in this class will look normal when running or controlling the ball. However, involuntary muscle contractions and hesitation before performing explosive

movements are activity limitations compared to the non-disabled players [23]. Athletes who fall outside these categories cannot participate in CP football.

CP football is a team sport, with the classification aimed at ensuring fairness about the impact of the decline between the two teams. The participating players must be in classes FT1 to FT3. To ensure fair play between two groups, each team (seven players) must have one FT1 player on the field at all times, and it is not allowed to have more than one FT3 player on the field [5]. The eye, hand, and foot coordination test instrument was designed to determine athletes' category and technical abilities.

The design of test instruments requires several benchmarks that must be met. First, the test instrument must measure the athlete's type of physical and technical components. This component relates to the validity of the test, which is the instrument's accuracy in measuring something. The second condition is that the tools and equipment used in each type of test must be easy to obtain and affordable (not expensive). The last requirement is practical administration and implementation procedures, does not require a long time (individually), and do not require a large implementation area. These requirements were discussed with experts in the Discussion Forum to determine the proper test. The results were used to develop instruments at the test development stage.

The test development stage contains various activities of creating, adapting, modifying, reducing, and adding procedures and tools to produce the ideal instrument. This stage was carried out through coordination with professionals and experts through Focus Group Discussions. The professionals and experts involved consisted of measurement test experts, physiologists, CP football coaches, and NPC administrators (Field of Achievement Development). The input given by the expert was used to improve and refine the product of the test instrument model.

Field construction requires a flat place, either with carpet, grass, or artificial grass, and there is a target in the form of a wall or board for the ball to bounce. The size of the field with a test distance of 4 meters from the target area was marked with a 1-meter line limit for the maximum limit the ball must fall (touch the ground) during the throwing test. The size of the target area, which was 0.5 meters high and 2 meters wide, was divided into seven value target areas. The target values were divided into scores of 1, 2, 3, and 4. The form of construction, field size, and implementation instructions for the resulting test instrument model can be seen in Figure 1, Figure 2, and Table 2.

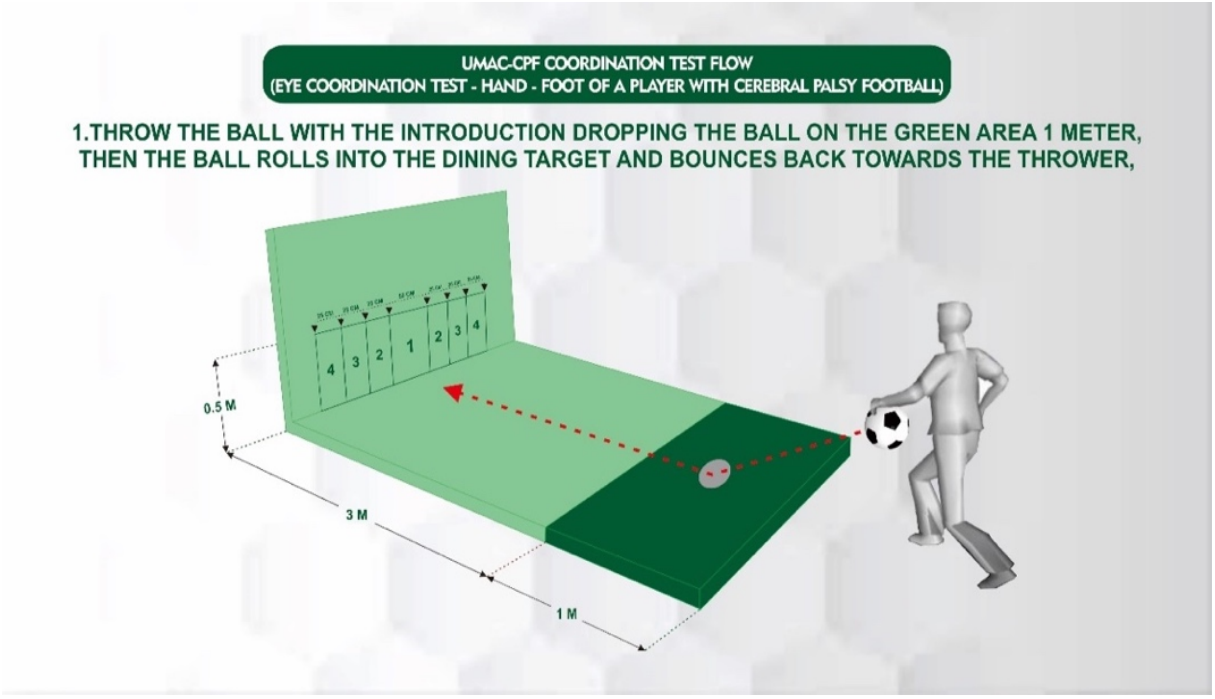

Figure 1. How to Start the UMAC-CPF Coordination Test by throwing

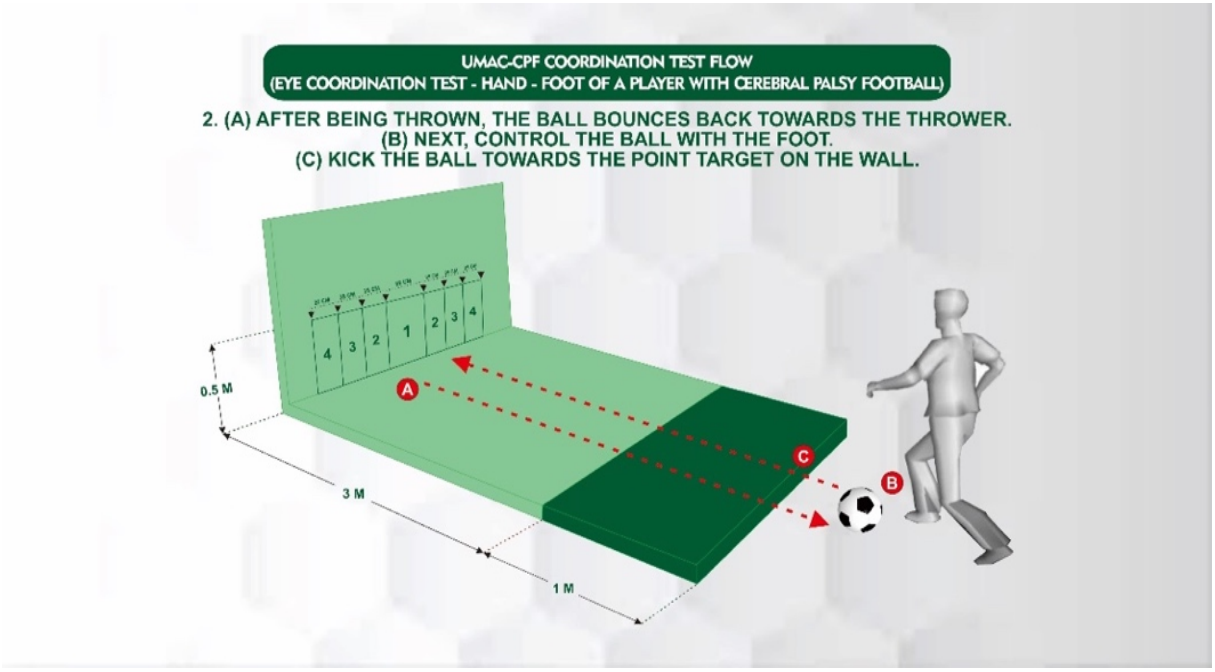

Figure 2. Advanced movement of UMAC-CPF coordination test by stopping and kicking the ball

Table 2. UMAC-CPF Coordination Test Instructions

Component	Description
Objective	Measuring eye, hand, and foot coordination for cerebral palsy football players (CP Football) and CP athletes
Tools and Equipment	● Test field (flat surface, grass (synthetic), floor, carpet) ● Target (wall/board) ● 2Twosoccer balls in size 5 ● Stopwatch ● Note-taking tools.
Implementation procedure	(1) The teste is ready to stand behind the boundary line by carrying the ball behind the boundary line at 4 meters from the wall (target) and unlimited sideways. (2) After the signal "Yaa," the teste throws and kicks the ball as quickly as possible towards the target (wall) measuring 0.5 m x 2 m high, given a scale of 4, 3, 2, and 1, continuously for 30 seconds. (3) The ball bounces from the throw or kick and must cross the predetermined boundary line. (4) Each teste is provided with two balls. If the first ball thrown or kicked does not cross the boundary line or go outside the boundary line, the teste is allowed to take the second ball (reserve) and then return behind the bar to continue the next movement until the allotted time runs out. (5) Suppose the second ball thrown or kicked does not cross the boundary line or go outside the boundary line. In that case, the teste can immediately pick up the ball without assistance from anyone, then return behind the line to make the next movement until the allotted time runs out.
Scoring	● The calculated score is the number of targets the ball has touched due to throws and kicks. ● The highest score is counted if the ball is thrown or kicked and hits the target line. ● If the result of the throw or kick does not hit the target, the score is "0". ● The test is conducted twice, and the best score between both tests is taken.

The first trial subjects in this study were all Central Java CP football players who would be prepared to face the CP Football Match National Paralympian Games 2020 in Papua Province, totalling 31 people. Each athlete was asked to give their best ability to get the highest score when taking the test. The classification of each athlete and the scores obtained are shown in Table 3: the test given measures an athlete's eye, a hand, and foot coordination. Athletes with milder movement constraints do not necessarily have better coordination than those with heavier motion constraints [24]. Table 3 shows that some athletes in the FT1 and FT2 categories were able to get better scores than athletes in the above categories.

Table 3. Cerebral Palsy Football Player Coordination Test Results

Respondent	Classification	Result 1	Result 2	Best score
1	FT 1	19	23	23
2	FT 1	18	17	18
3	FT 1	8	11	11
4	FT 2	21	14	21
5	FT 1	8	20	20
6	FT 2	7	13	13
7	FT 1	18	8	18
8	FT 2	15	19	19
9	FT 2	22	27	27
10	FT 2	25	29	29
11	FT 2	18	8	18
12	FT 2	16	17	17
13	FT 3	23	29	29
14	FT 3	18	12	18
15	FT 2	14	16	16
16	FT 2	22	21	22
17	FT 2	15	25	25
18	FT 2	16	11	16
19	FT 1	19	18	19
20	FT 1	21	15	21
21	FT 2	26	24	26
22	FT 2	18	33	33
23	FT 2	16	20	20
24	FT 2	21	25	25
25	FT 1	7	13	13
26	FT 2	18	8	18
27	FT 2	23	29	29
28	FT 3	18	12	18
29	FT 3	18	33	33
30	FT 2	16	20	20
31	FT 2	15	19	19
Total		539,000	589,000	654,000
Average		17,387	19,000	21,097
SD		4,876	7,294	5,600
Max		26	33	33
Min		7	8	11

The trial phase is expected to choose one coordination test item with the highest validity value (the best correlation). Statistical calculations using Pearson's simple correlation analysis (bivariate correlation) (Pearson Product Moment) were used to select the best test item to measure each coordination component. The correlated score is the item score obtained by sample members and the total score obtained by sample members in several measurements to get the highest validity value.

The test results were analyzed by bivariate correlation of Pearson Product Moment with the help of SPSS and can be seen in Table 4. The overall Cronbach alpha value indicates that the test instrument can be used in research. In other words, r_count was greater than r_table: 0,649 > 0,413. Cronbach's alpha value of 0.649 was found in the interpretation of the correlation coefficient with an interval of 0.60 - 0.799, which has a strong level of reliability. The correlation coefficient value with r-table of N-1 = (31-1 = 30) or the number of samples 30 and at the significance level of 5% = 0.05 is 0.361. The results of the instrument test data have a strong level of reliability. In other words, the data from the instrument can be continued at the research stage. After reliability is obtained, the next step is to determine the scoring norms of the designed test.

Table 4. Reliability Test Statistics of Cerebral Palsy Football Players' Coordination Data

Cronbach's Alpha	N of Items
0.649	3

The test scoring norms were determined based on the test results in Table 3. The scores of the athletes were entered into equation 1 to determine the scoring class interval. The goal is to categorize players' physical and technical abilities into five broad groups. The five categories are Very Good, Good, Moderate, Deficient, and Immoderate. The results obtained can be seen in Table 5, which shows the range of scores for each category. A CP football athlete with the best coordination ability will get a score of more than 29. If an athlete scores between 10 and 18, his physical coordination ability is only in the moderate category.

Table 5. Eye, Hand, and Foot Coordination Test Norms for Cerebral Palsy Football Players

Score	Category	Point
29 ≥	Very good	5
19 - 28	Good	4
10 - 18	Moderate	3
5 - 9	Deficient	2
≤ 4	Immoderate	1

The physical ability of football is the motor ability or component of fitness needed by athletes according to the sport of football and its role. Physic is the foundation of achievement building because technical, tactical, and psychological factors can be appropriately developed if athletes have reasonable physical quality provisions [25]. Not only that, a CP football player must master the basic techniques of playing football well. The basic technique referred to is the mastery of kicking techniques and involves processes related to the game of football [26]. The technique of playing football is all movements both without and with the ball needed to play football.

The basic techniques of playing football distinguish between basic techniques without the ball and with the ball. Basic techniques without the ball include skills to run fast and change direction, hop or jump, grab the ball, guard the opponent, find a position, and trick without the ball to escape from the opponent's control [27]. While the basic techniques with the ball are known by several terms such as kicking, passing, kicking towards the goal (shooting), heading, dribbling, scoring, tackling, stopping/controlling/trapping, throw-in, juggling, and goalkeeping skills.

All CP football players must master the basic techniques and skills of playing football because they will not be able to perform the principles and various game systems, develop tactics and read the game without mastering the basics of playing football with players [28]. Thus, a CP football player who does not master the basic techniques and skills of football is unlikely to become a good and famous player.

3. Conclusion

The research and development process has resulted in a valid and reliable unique eye, hand, and foot coordination test for Cerebral Palsy Football Players named the UMAC-CPF Coordination Test (UMAC-Cerebral Palsy Football Coordination Test). It produced a norm of Eye-Hand, and Foot Coordination Ability Test for Cerebral Palsy Football Player as a Very Good category (Point 5) if the score ≥ 29, Good (Point 4) if the score is 19-28, Moderate (Point 3) if the score is 10-18, Deficient (Point 2) if the score is 5-9, and the Immoderate category (Point 1) if the score is ≤ 4. The remarkable eye, hand, and foot coordination test model for CP Football players can be used practically by athletes, coaches, and educators. The resulting test instrument model is expected to reference scientific development for scientific research and writing. Researchers can use the model to retrieve coordination data or even try it as a method of coordination exercises in further experimental research.

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