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# PHYSICAL TESTING NORMS OF TABLE TENNIS PLAYERS 13-15 YEARS OLD IN INDONESIA

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**Abstract:**
The purpose of this study is to develop the physical test norms of table tennis players, men and women of 13-15 years old. The research method used is by the service through the field measurement test. Data analysis uses test-retest and part-whole techniques with assistance of SPSS version 23 software, while normality test is by using Anderson Darling program Minitab 16. Samples of the research a total of 141 players consist of 73 men player and 68 women player, age 13-15 years old who have been training for at least 2 years and exercising frequency 3 times a week. Results of the test norms include: arm span length, hand reaction speed, tennis ball catching test, shuttle run, 20 meters fast run and multistage run. The table tennis physical test norms are classified into five categories that are very good, good, moderate, poor and very poor.

**Keywords:** table tennis physical tests physical tests, 13-15 years old

## 1. Introduction

Currently many physical condition test models are used for the identification and development of physical tests of table tennis players for men and women (Pushpendra Purashwani, A.K. Datta, Manoj Purashwani, 2010), but have not been tested how much effectiveness they have on the appearance of table tennis athletes. The test should be relevant to player characteristics, reliable and specific as measuring tools, both individually and in pairs. So the validity level of a test shows to the user that the test is able to differentiate the characteristics of the player's physical capabilities. The selection of physical test elements is usually based on theoretical logic that the test element meets

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the physical fitness needs of table tennis and has not been empirically tested. According to Jimbaw, China's table tennis team coach in Kertamanah (2003) said that the higher the quality of technique that an athlete must master the greater the physical requirement it needs. Similarly, with the quality of the championship or the tournament to be followed, the greater the physical condition that an athlete needs to achieve in the championship. The development of regular and sustainable sports achievement is still perceived to be obstacles such as: (1) the absence of an adequate evaluation system; (2) time limitations and funds in the national sport's achievement efforts; (3) handling in progress of champion training has not been done continuously; (4) driving and recruitment of players are often done by observation or based on trainer experience. Therefore, it is necessary to have a table tennis physical test to be used as a valid and reliable guide based on table tennis physical indicators so as to develop the achievement of table tennis players. Selection of talent must be done with tests, aspects to be measured and known through tests covering all aspects of biomechanical, physiological and psychological, genetic, relatively permanent and unchangeable with other forms of training program. The biomechanical aspect is associated with the shape and size of the body, the physiological aspect associated with the organ structure of the body and the psychological aspects associated with intelligence and personality.

The most important thing to do with table tennis is the characteristics inherent in the game, namely: the game can be fast and lasting. Players must be able to move quickly to explore the corners of the field with fast, explosive movements, capable of using various techniques to hit the ball with various harmonious and accurate movements. Looking at the characteristics of the above motion, a good table tennis player must have the quality of the physical condition. Table tennis is included in open loop that is sport that requires high ability in decision making, responses, various psychological, physical and technical capabilities (Brad McGregor, 2008: 3).

Sports achievement in this case table tennis is influenced by a number of factors that support each other between factors with one another. The factors come from within or outside the player itself which include physical, psychological, technical, tactical, coach, training facilities, training activity, social, and so forth.

In addition, the player's appearance can be viewed from four dimensions: 1) The physical fitness dimensions include durability, explosive power, strength, speed, formation, agility, reaction, balance, precision, and so on. 2) The dimensions of the skill include: kinesthetic, certain exercise skills, movement coordination, and so forth. 3) Talent dimensions of inherited physical include: physical state, body height, weight, body shape, and so on. 4). Psychological dimensions include: motivation, self-awareness, aggressiveness, discipline, anxiety, intelligence, courage, talent, intelligence, emotion, concern, willingness, and so forth. Singer in Singgih D. Gunarsa (1989: 291) stated that sports are activities that cover physical, technical and psychic aspects. Sports peak achievement is the actualization of these three aspects. Physical aspects are player states that are related to morphological and anthropometric structures actualized in achievement, the technical aspects are the potential players have and can develop optimally to produce certain achievements, while the psychic aspect relates to the

structure and function of the characters that support achievement actualization achieved.

Table tennis is one of the sports that demands skilled players in playing table tennis where good achievement is required for good skills as well, in this case the player's skills in applying the basic techniques of table tennis in the game. A table tennis player has to master the basic techniques of playing table tennis well. The basic technique is not just the mastery of the beat technique, but also involves techniques related to table tennis game. The basic technique of playing table tennis must be mastered by a table tennis player among others; stance, bat handling technique, ball beat techniques, and footwork techniques.

A good player will be seen from his / her skills to perform the basic technique at the time of the game, where the player will perform service, punch or basic motion. Beside the mastery of the technique, the tactics and strategies of a table tennis player require completeness of the physical condition in order to achieve higher achievement. Many factors contribute to the achievement of table tennis, including (1) the skills and techniques required, developed, controlled, and enhanced or automated; (2) the abilities based on the body's setting fitness, movement, learning and coordination skills; (3) good behavior to deal with situations in the competition; (4) the development of tactics and strategies; and (5) the quality of affective, cognitive and social behavior.

The physical test form for table tennis players is suggested by some sports experts implied the phenomenon that the potential player must be known to his physical domain accurately. In relation to the achievement of sports performance in the future, the phenomenon can be analyzed so that the development process of achievement more effective and efficient.

Most table tennis games using hand skills require a good component of physical condition in terms of foot movement and punch technique to produce a good shot of the player in addition to having the right punch technique also need to use or maximize physical conditions such as: hip flexibility, reaction speed, foot agility, good sight coordination and plus durability and arm muscular power will make the player easier to anticipate the opponent's movements, the more perfect movement, the more maximum the shot is and be able to guess where the ball comes, thus the player can anticipate freely and perform a counterattack by directing a difficult place to reach the opponent with a punch and a fast spin ball that can make the opponent feels difficult to tackle.

Based on the above physical domain on hip flexibility, hand reaction speed, leg agility, eye coordination, arm muscular power are factors that have a major impact on table tennis skills. In addition to that, the higher the quality of the technique that must be mastered by a player then the greater the physical requirement required. Similarly, with the quality of the championship or the tournament to be followed the greater the physical condition is required by a player to achieve the championship.

Monks et al. (2006: 87) argued that adolescents are between the ages of 12-21. The age range is divided into several periods with the following divisions: 12-15 years old include early adolescence, 15-18 years old include mid-year, 18-21 years old include late

adolescence. Furthermore, adolescent includes a very decisive period because at this time children undergo many psychological and physical changes. In adolescence, physical development changes faster than the childhood and adulthood. The physical development of adolescents is clearly visible on the limbs and hands, legs and arms of the bones, and the body muscles are growing rapidly. The development of motion is a continuous development process related to changes in human behavior. Changes in behavior and appearance of a person are associated with age. Adolescence is a transition period from childhood to adulthood. This is usually seen in terms of sexual maturity and rapid growth. Teenage years begin with the acceleration of the average growth before reaching sexual maturity, then the phase of the slowdown, and stops after no further growth after reaching adulthood. In adulthood, there are complex biological developments which include the acceleration of growth, changes in body shape proportion, changes in body composition, maturity of primary and secondary sex characteristics, development of respiratory system and cardiac work, and coordinate body, sexual and physical changes physiological.

Final growth of men begins with the length of the limb, then long front body and widening of pelvic and chest, shoulder and finally chest thickening. The growth of long limbs with front body about one year will occur in a year. The late maturity is characterized by the sequence, duration and intensity of the various body segments during the growth period. A slow-growing child has longer limb growth so proportionate limbs are longer than front body. In more mature men tend to have shorter limbs with larger pelvis than those who are in late maturity. While late mature women tend to be have longer limbs and wider shoulders than those who are more mature.

The difference in body shape between men and women becomes clearer after puberty. Both sexes have different skeletal sizes. Men become an adult with longer legs and arms and wider shoulders, while in adult women will look bigger proportion in hips. Adolescence will grow rapidly until it reaches sexual maturity, then the phase of the slowdown arises until there is no further growth. Growth that causes changes in size, such as proportion of body shape, changes in body composition, circulatory system, breathing, nervous system, primary and secondary sex and so on. At the beginning of women's adolescence is higher and heavier than men's condition is not too long after rapid changes occur in men. Then men outperform women's height and weight, as well as other measurements, such as front body, leg length, shoulder width, and arm size. Proportionally changes occur in bones and fat tissue. The growth of muscle bones goes up with a high increase and weight. While decreasing fat tissue volume is more visible in men than in women. One physiological change is the basal pulse which is always decreasing gradually and equally for men and women from birth, but in adolescent age decreases in men is faster than women after age 12. The comparison of the initial changes of the holding strength of boys is almost double compared to girls, while the force attracts and pushes almost four times the size, though up to the age of 13 is almost no difference.

## 2. Research Method

In accordance with the purpose of the research, the method used in this study was observational method which was predictive because there were two aspects that were developed that is predictive research aiming to predict the criteria through certain predictors and norm preparation. Data collection techniques used were test and field test (field test) from 21 test items. Research sampling technique used a total sample of 13-15 years old players in Central Java consisting of 141 players comprising 68 women and 73 men, with criteria having been involved in minimal 2-year table tennis exercises. The data analysis technique used test-retest techniques and overall parts for the entire data test using intercalation of instrument elements and criterion with the help of SPSS software program version 23, while the normality test with Anderson Darling program Minitab 16.

## 3. Research Results and Discussion

### 3.1 Research Results

Based on the results of the physical test analysis of a total of 21 tests tested by inter location inter-variable tests, 6 physical test items were selected for men and women of 13-15 years old. Then a physical test norm was structured that could be referenced to determine the exact type of physical test at the table tennis sports. The test norms between men and women were divided into 5 categories, including: Very Good (VG), Good (G), Average (A), Poor (P), and Vey Poor (VP). In detail, the types and norms of tests are shown in the following table:

**Table 1:** Physical Test Norms of Table Tennis Men of 13 to 15 Years Old

| Category | Arm Length (cm) | Hand Speed Reaction (cm) | Eye-Hand Coordination (times) | 20 M run (detik) | Shuttle-Run (detik) | MFT (VO2max prediction) |
|---|---|---|---|---|---|---|
| Very Good | ≥ 170.8 | ≤ 10.8 | ≥ 15 | ≤ 2.99 | ≤ 5.91 | ≥ 41.20 |
| Good | 160.7 - 170.7 | 10.9 - 15.7 | 13 – 14 | 3.00 - 3.48 | 5.92 - 6.78 | 36.14 - 41.19 |
| Average | 150.6 - 160.6 | 15.8 - 20.7 | 9 – 12 | 3.49 - 3.99 | 6.79 - 7.65 | 31.07 - 36.13 |
| Poor | 140.5 - 150.5 | 20.8 - 25.7 | 7 – 8 | 4.00 - 4.48 | 7.66 - 8.52 | 26.01 - 31.06 |
| Very Poor | ≤ 140.4 | ≥ 25.7 | ≤ 6 | ≥ 4.49 | ≥ 8.53 | ≤ 26.00 |

**Table 2:** Physical Test Norms of Table Tennis Women of 13 to 15 Years Old

| Category | Arm Length (cm) | Hand Speed Reaction (cm) | Eye-Hand Coordination (times) | 20 M run (detik) | Shuttle-Run (detik) | MFT (VO2max prediction) |
|---|---|---|---|---|---|---|
| Very Good | ≥ 158.2 | ≤ 11.9 | ≥ 13 | ≤ 3.45 | ≤ 7.02 | ≥ 35.16 |
| Good | 151.4 - 158.1 | 12.0 - 17.4 | 11 - 12 | 3.46 - 3.93 | 7.03 - 7.86 | 31.70 - 35.15 |
| Average | 144.5 - 151.3 | 17.5 - 23.1 | 7– 10 | 3.94 - 4.43 | 7.87 - 8.72 | 28.23 - 31.69 |
| Poor | 137.7 - 144.4 | 23.2 - 28.6 | 3 – 6 | 4.44 - 4.91 | 8.73 - 9.57 | 24.78 - 28.22 |
| Very Poor | ≤ 137.6 | ≥ 28.7 | ≤ 3 | ≥ 4.92 | ≥ 9.58 | ≤ 24.77 |

**Table 3:** Score Combination of Physical Test Conversion Value of Table Tennis Men and Women of 13-15 Years Old

| Category | Conversion Value | Men Score | Women Score |
|---|---|---|---|
| Very Good | 5 | ≥ 25.4 | ≥ 24.98 |
| Good | 4 | 21.0 - 25.3 | 20.46 - 24.97 |
| Average | 3 | 16.6 - 20.9 | 15.92 - 20.45 |
| Poor | 2 | 12.2 - 16.5 | 11.40 - 15.91 |
| Very Poor | 1 | ≤ 12.1 | ≤ 11.39 |

## 4. Discussion

The physical test norms between men and women were different. This indicated that in order to identify table tennis performance, dominant influencing factor were the right choice to implement. The test norm is as detailed below:

The length of arm range was selected as a test element; this indicated that the measure statistically had an inter-correlation with other elements, so that the length of the arm range could represent biometric measurements that correlated with the achievement of table tennis performance. Observed from the science of motion on the lever system theory, the length of the force arm was proportional to the acceleration, meaning that the longer arm style was the more advantageous to produce a stronger force to fight the load.

The table tennis player's hand reaction speed was a reflection of the special technique of docking so it indicated that the skills in table tennis required a specific quality capability so table tennis players were required to have high reaction speed in anticipation of ball. Players with low reactions in reaching the ball were in trouble besides receiving and returning the ball towards the opponent.

The 20 meter fast run was the ability to achieve the maximum moving speed of the stationary position. Such skills were required in table tennis games, as table tennis games required players to always move quickly toward the ball placement of the opponent during the rally. Survey results at the Solo Mayor Cup (2015) obtained data on the long rally in the table tennis player age 13-15 years of 39 men players and 41 women who earned the average long rally for male players 4.05 seconds and 3.90 seconds for women. This indicated that the adjustment to move as fast as the rally corresponds to a 20-meter short run. The average test run speed was 20 meters in age 13-15 years on men players 3.97 seconds and 4.17 seconds for women. Malagoli Lanzoni Ivan (2011) explained that the speed of running for men had more speed than girls. The 12-year-old men began to demonstrate a significant increase in movement ability compared to the same daughter in the same age.

Players who had good coordination between eyes and hand would produce forehand punch more precisely on the target, compared to players who were less able to coordinate both the components. Players would be easier in anticipating the ball and doing the counter strike properly. The first thing a table tennis player would anticipate was to see the opponent's movement then read the direction of the ball to determine the correct distance to swing the bat, the table tennis player must be able to hit the ball in

the direction of the opponent to make it difficult to accurately tackled by opponent (irene). Benefits earned by players with good eye coordination; 1) the player had a good level of accuracy, 2) the player was able to read the ball movement, 3) the player could perform high anticipation, and 4) the player could perform a counterattack carefully.

Without proper agility, the table tennis player would have difficulty doing every movement either blows, smashes, or moves anticipate an opponent's attack. The disadvantage of a player who did not have good agility was easily off the opponent, either through attack or anticipation of the opponent. Some of the advantages of players with high agility were; 1) the player had a footwork and could freely move, 2) the player was able to attack and anticipation attack carefully, and 3) the player was able to move and punch flexibly.

Multi stage run as a performance indicator was used to explain the differences in performance of men and women players, monitoring athlete training, predicts optimal training intensity. Similar measurements done by L.A. Leger, D. Mercier, C. Gadoury (2008) showed that the equation of multi stage run test results for men and women aged 12-16 years old, the reliability coefficient value (r = 0.95) for boys and = 0.89) for girls. From the run, movement of multi stage tests that demanded periodically to be faster also indicated that the quantity of multi-run scores was related to the ability to maintain motion speed for a long time. This meant that the demand for table tennis games had to move fast to complete the game for a long time reflected from the demands of the run of the run in the multistage run test. Giorgos P. Paradisis, Elias Zacharogiannis (2014) claimed that the world's table tennis player was required to have a max VO2, at least 50-56 ml / kg / min men

## 5. Conclusion

The physical tests of table tennis players aged 13-15 years include: 1). Length of arms, 2). Hand reaction speed; 3). Tennis ball catching test; 4). Shuttle run; 5). 20-meter fast run; 6) A multistage run. Norms of physical tests of table tennis players of 13-15 years old have implications for the system selection and exercise of table tennis achievement, the effort will be more efficient with a scientific approach, one of which is by using field tests and measurements for table tennis players because they will statistically give influence in the success of coaching and better than not using the test or only through train observation.

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