Bleep Test Countermeasures Test Using Infrared and Microcontroller Based Computer System

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Abstract: *This paper describes the mechanism of the work tools system up as a tool to calculate shuttle bleep test to measure aerobic endurance. Practical subject in this research is bleep test aerobic endurance is teste. As a means of aerobic endurance bleeps test, is a standard test by utilizing music as a reference backbone and is in need of countermeasures and the achievement of test norms. The research was conducted by developing a computerized instrument by using infrared as a motion sensor microcontroller base. Most users prefer to use this research tool as it is more effective, efficient and objective than manual procedure. The combination of infrared rays connected to the microcontroller and the computer greatly help the efficiency of the test work system.*

Keywords: Shuttle Tools, microcontroller, Bleep test, aerobic

1. Introduction

All sports that are dominant physical activity desperately need aerobic endurance (DTA). DTA is often interpreted with Maximum Oxygen Volume (VO2 Max) which means that the ability of the lungs to store oxygen as much as possible. DTAs are required during matches for the duration of the game to remain powered while the training can accomplish the task of training that is given optimally. Endurance depends on several factors such as speed, muscle strength, technical ability to perform movement efficiently, the ability to use physiological functions of the body economically psychological status when performing activities [1]. This becomes the basis of the importance of knowing the aerobic capacity of an athlete to establish the ability of one's heart and lungs. One instrument that is quite popular to use is bleep test [2], [3], [4]. Bleep test is a test instrument for measuring athletic aerobic capacity and is performed back and forth with a distance of 20 meters using a 20 meter rhythm [5], [6].

There are some weaknesses in manual test bleep namely; the use of difficult tools such as the provision of sound systems, tape recorders, manual counting counts and various other administration test equipment. The impact of the weakness is often a miscalculation and it is difficult to determine the accuracy of feedback and ultimately affect the results of aerobic endurance tests.

Various studies have been conducted to improve the efficiency and effectiveness of bleep test with computer utilization as a tool [7] developing computer bleep test software. The study developed the recording of the results one by one, the bleep test time indicator shown to be shown to the testee for the tester to bleep test with the maximum. Number indicator to match the tester. The results still have weaknesses; (1) the technical count is still manual calculation, (2) has not utilized the motion sensors and (3) the use of tape recorder tool. The software is good enough but needs to be crafted to produce tools that can minimize weaknesses. Besides that it has also been developed bleep test software team that is the 20-meter beep test team that is released by United Kingdom or the United Kingdom and Bleeptes that can be used in Iphone in realease in UK.

This is the underlying need to develop a tool bleep test that is named shuttle tools. This study aims to produce bleep test tool by utilizing motion sensor infrared computerized system based on microcontroller. Shuttle tool is a tool to calculate inverse bleep test by utilizing infrared beam as motion sensor which connected to microcontroller and direct entry to computer software application system to display bleep test result end.

2. Method

This research was conducted in Physical Laboratory of Faculty of Sport Science Unimed in September 2017. The sample of this research is 30 people with purporsive random samling sampling technique. Research and Development research methods (R & D) of Borg and Gall model [8] is a research method used to produce a particular product and test the effectiveness of the product. The steps of this study can be explained in the picture below flowchart.
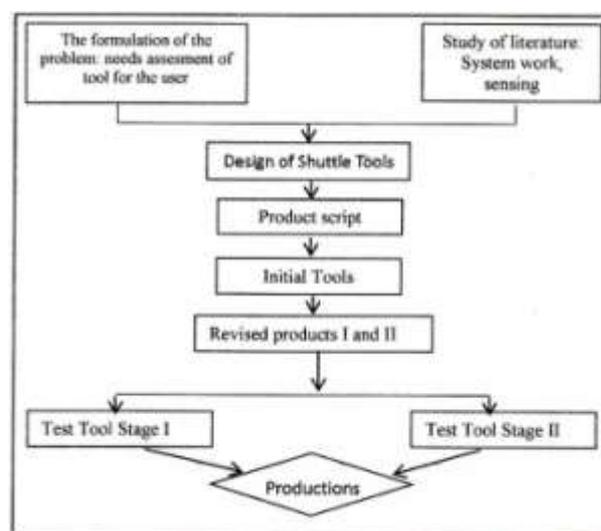

Figure 1: Diagram of the research flow

The instrument of this research use: using closed and open questionnaire. Closed questionnaires are used to determine the level of effectiveness and efficiency of the product. Open Questionnaire is used to know the weakness and non-conformity of tools to the needs of the product and is used during Focus Group Discussion (FGD) .The data analysis techniques used in this research are: (1) Needs analysis using percentage technique to see the level of product requirement, (2) To measure the effectiveness and efficiency of the product use as a validity test with FGD technique by 5 experts namely test and measurement experts, sports coaching experts and IT experts. (3) to see the effectiveness and efficiency of the model used phase 1 trial for 10 people and group 2 trial as many as 20 people using questionnaire.

3. Result and Discus

From the analysis of needs that have been done to 35 respondents consisting of administrators, coaches and athletes from some Pengcab, so that 89% of respondents said that they have done the measurement of local muscle endurance and 11% never did. Then 56% of the respondents said they had done local muscle tests using digital equipment and 44% did not. Furthermore, respondents say 100% of respondents need digital equipment to develop local muscle endurance. Then 59% of respondents answered the measurement using digital tools have better accuracy than manual and 41% disagree. Furthermore 92% of respondents said that if there is a digital tool to measure the muscle endurance of local respondents desiring to use it and 8% do not want to use it. The results of needs analysis can be illustrated in the diagram below:
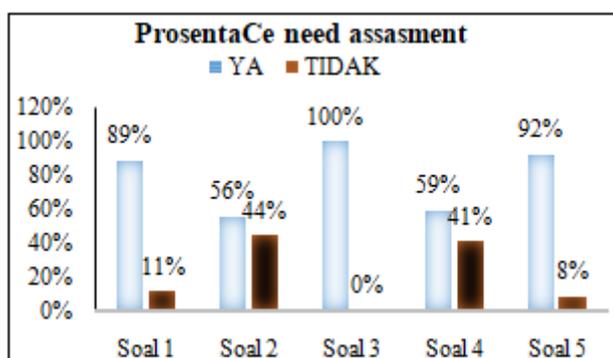

Figure 2: Prosentace of Need Assesment

The initial product design of the sutlle tool is able to work to guide the bleep test execution mechanism. The working system of the tool begins with the availability of a 20 m trajectory with 1.5 m trajectory width. To record the tray is used infrared motion sensor to guide the limit of feedback 0 - 20 m mounted on the upright pole. To record the repercussion mounted microcontroller-based recorder in the right / left waist according to the position of the infrared sensor. Recorded sensor results are recorded will be stored in the microcontroller connected computer network.
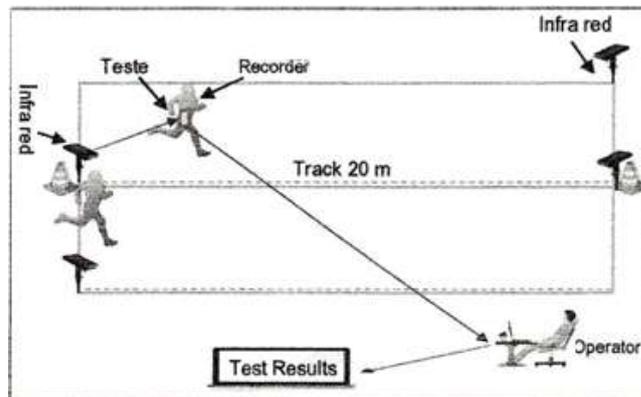

Figure 3: A set of shuttle tool works

When the runner starts running from the first point when getting a vibration alert and sound from the recorder that has been installed in the body. The sign will be on for 5 seconds when the button on the recorder is pressed. At this moment the runner is already entering the Bleep Test level 1. 1. After arriving at the second point the teste starts running again to the first point when the alert shakes and turns on. By the time the teste is at the Bleep Test level 1.2. To go on, the teste starts running from every point to another point should wait for the vibration alert and sound on the recorder. If the teste has not arrived at the next point and the sign is on, it indicates that the runner failed, and will light the sign that the teste failed. When 3 times fails sequentially then the alarm will sound an omen to terminate the test. When the alarm sounds will be connected to the mokrocontroler which is then automatically recorded on a PC or laptop computer and the test results appear Vo2 Max test.The result of 3 expert validation shows that the design of shuttle tools is categorized well and can be continued.
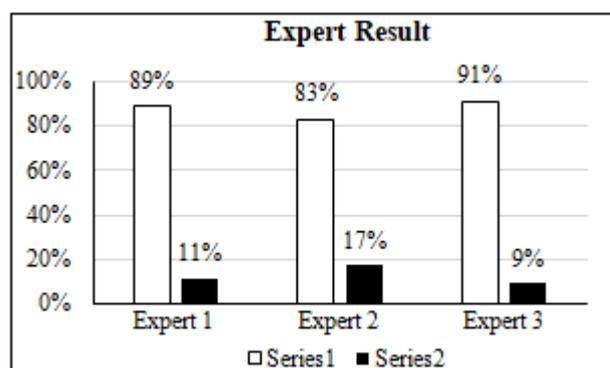

Figure 3: Expert Justment Result

4. Discussion

The design of the bleep test tool "shuttle tools" is a digital system tool that helps the tester make measurements on the athlete. Utilization of digital devices in measuring the performance of one's motion is very effective and shows a high level of objectivity [9]. The initial startup of the shuttle tool can be used as a tool to measure the bleep test with a good level of objectivity. Shuttle tool works by utilizing infrared beam as a tool of digital motion sensor and connected to mikorokontroler which then connected to PC. The calculation results will be analyzed with the application and the count count will be seen on the display. The numbers appearing on the display will be translated by app

and show the category of bleep test results. Shuttle tools have the advantage of not having to use large hardware and can be done alone with equipment that is easy and cheap. It is believed that the shuttle tool is the best solution for sports actors who want to know the level of aerobic endurance or VO2Max.

5. Conclussion

This paper describes the design of bleep test tool based on microcontroller by utilizing infrared body motion sensor. The initial draft draft describes the mechanism of the shuttle tool's work from the beginning to the end of the test. The result of initial draft design as follows; the catch of the infrared sensor is connected to the mocrocontroler and subsequently channeled to the PC automatically. Countdown count results will be seen on the display, especially connected with the recorder and automatically. The whole thing will be integrated which shows the result and level of each teste and shows the category VO2 Max.

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