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Design and Development of "Speed Light" Saq Lighting and Training Equipment Digital Lighting Digitalization Based on Infra Red Motion Sensor

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Abstract: ***This study examines the use of digital equipment named speedligth which is used as a training tool and measuring instrument for SAQ. Speedligth is a digital system that uses infrared sensors as motion sensors. This study aims to produce products; (1) Speedlight manual, and (2) Speedlight hardware and software and (3) test administration applications. This study uses a research and development approach which is divided into three stages. The first phase consulted experts / experts on the development of sports technology tools, needs analysis through needs level survey, the preparation of the instrument. The second stage was developing speedlight products, starting the initial product development script (manuals), designing digital speedlight tools, computer-based test administration applications, group trials. small, stage I improvements, large group trials, stage II improvements, mass production. The third stage of the implementation of the results of technical personnel training and dissemination, scientific publications in reputable international journals. The study concludes: (1) the results of the needs analysis indicate that the design of the SAQ "Speedlight" measuring instruments and exercises that are very needed showing 80% said that it was needed 15% and only 5% said that it was not needed. (2) The results of expert evaluation analysis note that 89% of the criteria are stated and can be used.***

Keywords: Speedlight, infrared sensor, microcontroller, Digital

1. Introduction

Technological developments that are so rapid at this time make people want to always be creative and trigger to create something new which can be applied and can be used effectively and efficiently. The development of this technology has into all important aspects of human life so as to stimulate the entire thinking pattern of the world's population focused on the use of technology, including in the field of sports. This is what underlies that the importance of the next generation of Indonesians who have new ideas that are more creative and innovative in advancing sports science and technology produced through research. This is because this generation will be able to carry on the relay of sports science and technology so that it can continue from generation to generation. If these expectations can be realized, it can be ascertained that in the future Indonesia can catch up with science and technology from other countries.

Given the central role of science and technology for the advancement of sports, it is time for universities to conduct research / research that is able to produce appropriate technology products to help sportsmen improve athletes' achievements and ultimately in promoting a nation's sport. The application of sports science and technology in general leads to the field of Sport Industry, Techno Sport and Sport Science. This is the basis of the importance of research to develop sports science and technology immediately, and in the process requires collaboration between practitioners and sports academics with experts in various fields. One of the science and technology products is developing sports equipment that is useful for training and measuring Speed, Agility and Quickness (SAQ) to produce more effective, efficient and objective exercises and tests [1].

SAQ is a form of exercise that can develop speed, agility and motion reactions simultaneously. Speed agility and quickness training can increase speed and agility [2]. Furthermore, it is emphasized that speed agility and quickness training is suggested as an efficient strategy to improve training that is very specific and detailed in achieving athletes' goals, especially in increasing speed and agility [3].

Exercises are carried out by generating movements quickly on objects that change and are very much needed in almost all sports. Another opinion is that speed, agility and quikness are expected to increase the athlete's ability to use maximum strength during high speed movements [4]. Furthermore, it is emphasized that speed agility and quickness training is suggested as an efficient strategy to improve highly specific and detailed training in achieving athletes' goals, especially in increasing speed and agility [5] [6]

Besides that, it is also important to measure these three variables through digitization. Therefore, it is necessary to design a tool, hereinafter referred to as a multifunctional speedlight which is useful for stimulating motion reactions with various variations while measuring the performance of each controlled digitization-based movement. The tool will help athletes and coaches in designing exercises in accordance with the characteristics of the sport they are involved in and can be used as a valid, reliable and objective measure of SAQ.

Looking at these factual conditions, it is very important to develop an appropriate technology tool that can design further training to measure with the use of digitalization equipment in the form of technology products, as well as making digital equipment a part that is inseparable from the exercise training process. One of the benefits of sports technology products is to make it easier descending systemic

exercise and performing accurate and objective precise athletic measurement tests. Limited funding is one of the causes of the limited availability of sports science and technology equipment in the regions. This would be the basis of the importance of modifying the multi-function SAQ exercises which are then named Speedlight.

Considering the central role of technology in supporting athletes' performance, especially in improving and measuring SAQ as a training tool and speed measuring device, it is crucial to determine the results of measurable training. Therefore, it is very necessary for a digital device that can design training and measure objective SAQ velocity through research with the title of the design of measuring instruments and SAQ exercises visual lighting "speedlight" digitizing infrared motion sensors.

Specifically this research aims to produce products; (1) speedlight manual, and (2) speedlight hardware and software and (3) test administration application. Users of this research product are; (1) sports stakeholders which include; Sports College, Indonesian National Sports Committee, Dispora, Management of sports and school branches, Indonesian National Armed Forces and, (2) sports actors which include; trainers, athletes, Sports and Health Physical Education teachers, sports practitioners and sports researchers.

2. Method

This study uses a research and development approach or development research [7]

In general, the research procedure is carried out through several stages, namely; (1) The pre-development stage includes; needs analysis, (2) Development Phase includes, preparation of manuscripts and design of Speedlight tools in the form of manuals and initial products, and production, and (3) the implementation phase includes; training of technicians, product experiments and Speedlight dissemination as a measuring tool and multifunctional SAQ exercises.

3. Result and Discussion

1) Needs Analysis

The results of the survey and responses on the importance of developing a SAQ "Speedlight" measurement & training tool for sports stakeholders, terter and teste showed that 80% said that a much needed 15% was needed and only 5% stated that it was not needed.

Based on the results of this survey, it can be believed that the development of visual digital devices based on infrared motion sensor lighting is needed.

2) Tool Design

Technically, this infrared motion sensor based Speedlight visualization measuring instrument works as follows:

Equipment prepared:
Speedlight tools that have been designed in advance with electronic materials such as microcontrollers, displays, ultrasonic sensors (infrared), transistors and cables

Ways of working :
First turn on or turn on the Speedlight device with the power on / off button that has been designed, then the athlete takes a position in the Speedlight measuring instrument such as speed, agility and reaction, the athlete performs reaction movements such as running then touches the Speedlight tool that lights up the visual lighting that has been compiled in some places so that the device records movements that will later be measured by the motion measurement on the display.

Expert Validation:
Based on the data and responses collected from electronic / digital experts, coaching experts, and test and measurement experts, there are several product parts that need to be revised.

- How well this tool will be developed as best as possible.
- There are still deficiencies, maybe because of new products, so the input method is fixed again to make it easier for component users to work properly, but storage from the display to the computer is a bit complicated.
- Still a little understanding of how it works because this tool is newly designed, so after completion, it will slowly understand it

This is done to further optimize the benefits of developing the Speedlight measuring instrument for digitizing motion sensors based on infrared motion sensors.

Table 1: Trial Expert Evaluation Data

No	Aspect	Percentile
1	Is this Speedlight measuring instrument suitable for use in training programs	75%
2	Can this Speedlight tool measure automatically, making it easier for users.	100%
3	According to you, this Speedlight tool can help in increasing the ability to measure local muscle endurance	100%
4	Can each component of this tool work properly according to their respective functions?	75%
5	Does this tool have a fast response in measuring reaction speed	100%
6	What is your assessment when this tool is assembled?	100%
7	Can you understand how this tool works?	75%
Total		89%

From the expert evaluation analysis table, it is known that the total score of respondents (∑X) is 25 overall score (∑Xi) is 28 so the percentage is 89% of the specified criteria and it can be said that the Speedligt measuring instrument meets Valid criteria (80% - 100 %) so that it can be used.

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