

# Coordination Instrument Vibration Sensor Model

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## ABSTRACT

The development of technology nowadays has undergone very rapid changes, various fields have taken advantage of these technological developments. One of the things that can be done in accordance with the field of science being pursued is the development of sports science. The science of sports is still adapting to the development of science and technology, many sports have been used in the training process and during the competition. In addition to training and competition coaching, instruments for measuring sports skills also need to be developed. The test instrument for throwing and catching ball is based on a vibration sensor. Development is carried out by utilizing a vibration sensor as a detection tool integrated into a computer. This development is intended for the implementation of the coordination test that is used manually, which can be done using a vibration sensor based instrument so that the calculation results can be more valid and the implementation of the test is more effective and efficient. The research method used in this research is Research and Development (Research and Development). Respondents in this study were evaluation experts, physical test experts, electronics experts and physical education students as subjects of instrument testing.

**Keywords:** *Development, Instruments, Coordination, Vibration Sensor Model.*

## 1. INTRODUCTION

Physical fitness is a basic need in daily activities, a person can be said to have good physical fitness, when in the activity he still has the ability to do other activities, this is in line with what Widiastuti said that physical fitness is a condition physical which describes the potential and physical ability to perform certain tasks with optimal results without showing significant fatigue[7].

Regarding good physical fitness, a person must have a good physical component as well. Bompa[2] states that the physical components include: strength (strength), speed (speed), agility (agility), balance (endurance), muscle power (muscular power), flexibility (flexibility) accuracy (accuracy), reaction (reaction), and coordination (coordination). The elwijonoement of this physical condition is an absolute thing that must be owned by a person in order to stay fit and achieve.

The Institute for Educators and Education Personnelis an institution that is currently a member of 20 State Universities and Private Universities in Indonesia [3]. Every year it receives new students through the National Selection for State Universities, Joint Selection for State Universities (SBMPTN), and the State Higher Education Independent Examination.

Sriwijaya University, especially the SBMPTN Penjaskesrek Study Program, conducts theoretical tests and physical tests. The physical exam for prospective new students uses a test battery, namely the Indonesian Physical Fitness Test (TKJI). The SBMPTN physical skills test consists of 6 types of tests. Some are related to the test taker's physical health and fitness. 6 types of test forms, namely 1) Throw catch ball against the wall (Wall Pass), 2) Throw Upright (Vertical Jump), 3) Sit Up Test 60 seconds, 4) Push Up Test (60 seconds), 5) Agility Test (Illinois Agility Run Test), 6) Endurance Kardiorespiratori (1600m run). However, the tests carried out still use

manual instruments, so the results obtained are less valid when the implementation time is less effective. One of the hand eye coordination tests is by throwing a catch ball against the wall. During the implementation of the catch to the wall test, there is a build-up of new student candidates for the physical education, health and recreation study program which is caused by ineffective test kits, because the test is done manually, besides that the available space is not wide enough, so when the wall catching test takes place too long, it took a lot of time and energy for the test field organizing committee. The length of time the test catches the wall makes the participants pile up on this test. Seeing the ineffective manual coordination test, there was an idea to develop a coordination instrument based on vibration sensors. Analysis of the needs in this study is the need for new innovations by developing vibration sensor based instruments.

The development of science and technology today has had a significant impact in the field of sports, especially in the field of fostering athletes for achievement, as previously stated by Wijono through training athletes in the field of sports has provided evidence that achieving high achievement is not instantaneous. , however, it takes a long, gradual and continuous coaching process accompanied by the proper use of sports science and technology[8]. Raja said Technology influences various aspects of life. The application of technology has revolutionized the field of education. The importance of technology in schools cannot be ignored. With computers in education, it becomes easier for teachers to spread knowledge and for students to acquire it so that the use of technology has made the learning process more enjoyable [5]. According to Aninkia, the development and optimization of technology and training techniques are able to effectively solve problems focused on practices that require oral communication skills [1].

This development research was carried out to facilitate the implementation of the coordination test, so that the time for carrying out the eye and hand coordination test was faster and more practical and valid in the calculation results, besides that the products produced in this study could be used by the physical education study program for lectures, especially in test and sports measurement subjects. KONI and the wider community as one of the newest instruments and based on vibration sensors.

According to Tait, that the vibration detection device can be attached to the arm near the end of the arm. A vibration detection device can be operationally connected to the sensor in such a way that the sensor emits a rotational position once it detects a new vibration which exceeds the amplitude threshold [6]

The purpose of this study was to develop a coordination test instrument used for physical tests for prospective physical education students of the FKIP UNSRI and the wider community. Research on hand-eye coordination instruments should be carried out to make the implementation of the test more practical and accurate so that the results of the measurements are more valid.

## **2. METHODS**

The research approach used in this research is research and development, with the reason that it is in accordance with the objectives to be achieved, namely in the form of a prototype development model for hand eye coordination test.

Activity steps, namely 1) Preliminary Research. The first step in this research is to conduct a preliminary research by carrying out a need analysis for the development of a vibration sensor-based eye and hand coordination test instrument. 2) Instrument development planning, the next step after getting the idea is to make an initial product design in the form of a series of instrument development tests for eye and hand coordination tests based on vibration sensors. The process of making a product developed by a researcher must consult the product with technical experts / trainers, training experts, in order to produce a perfect product. 3) Validation, Evaluation and Revision of Instruments, in this research and development activity after developing a test instrument for the eye and hand coordination test based on vibration sensors, namely a) Expert Judgment, the experts involved in this Research and Development are technical experts. electronics, software specialist and sports test and measurement specialist. The results of the evaluation from the experts will be used as input in refining the design of the instrument development model for the throw test instrument of the vibration sensor-based eye and hand coordination test before being tested in small groups. (a) Small group try-out, small group try-out for physical education students. The results of the respondents conducted by the small group Physical Education students were the second evaluation after the evaluation of the previous experts. 4) Product Revisions, Input from the

results of questionnaires and field notes on small group tests and input from experts or experts are used to revise the product. This is done to improve the instruments that have been felt and experienced for the subject for the next group test. Revise the product after conducting the test small group trials will certainly determine the better product to be tested in large groups. So that the improvement can result in the development of a vibration sensor based hand and eye coordination test instrument product. 5) Large group trials, the next activity is to conduct field trials or large group trials, in further activities of research research and development of instruments for eye and hand coordination tests based on vibration sensors. The results of the large group trial are the final basis for the improvement and refinement of the instrument development test instrument vibration sensor-based eye and hand coordination tests. 6) Product Revision, at this stage the results of large group trials from large group trials are the final basis for product improvement and enhancement of vibration sensor-based eye and hand coordination test instruments. The evaluation at this stage is the final evaluation of the development of the vibration sensor-based eye and hand

coordination test instrument, after corrections according to input from the field test, the product is deemed fit for distribution or use. 7) Effectiveness test, this trial aims to (1) determine whether the instrument has been implemented properly and correctly by the researcher, and (2) how effective are the results of applying the model to the objectives of this study. Model implementation.

### 3. RESULTS AND DISCUSSIONS

Validation is defined as an act of proof in an appropriate manner that each material, process, procedure, activity, system, equipment or mechanism used in production and control will always achieve the desired results. The development of a sensor-based coordination test instrument was validated by experts in their fields. Expert is the ability of someone who has special expertise and can be accounted for by his expertise and experience according to his expertise. Experts involved in this research are sports test and measurement experts, software experts and electronics experts.

Results of Product Validation by Phase I Tests and Measurements. The results of the expert validation of the stage I measurement test are as follows:

**Table 1.** The results of the expert validation of the stage I

No	Rated aspect	Score Obtained	Maximum Score	%	Category
1	Aspects of Originality	11	16	68,5	Good enough / decent enough
2	Physical Aspects	9	12	75	Good enough / decent enough
3	Design Aspects	14	20	70	Good enough / decent enough
Total Score		34	68	71.2	Good Enough / Decent Enough

Based on the results of the test expert's assessment and sports measurement above, in the aspect of originality the score obtained was 68.5% in the category of "Good Enough / Fair Enough" to be continued to the next stage. On the aspect of excellence, innovation received a 75% score for the category "Good Enough / Fair Enough. The benefit aspect received a score of 70% in the "Good Enough / Fair Enough" category. So that the average assessment of the sports test and measurement expert is

71.25% in the "Good Enough / Fair Enough" category to be continued to the next stage after revisions are made according to what has been suggested.

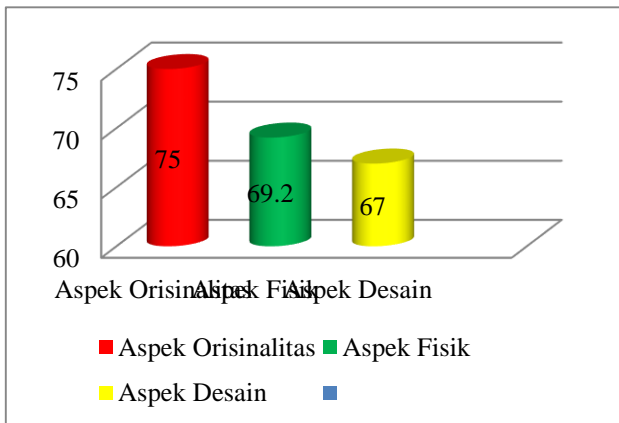
Results of Product Validation by Stage I Software Experts as shown Table 2.

**Table 2.** Software expert validation stage 1

No	Rated aspect	Score Obtained	Maximum Score	%	Category
1	Aspects of Originality	6	8	75	Good enough / decent enough
2	Physical Aspects	36	52	69,2	Good enough / decent enough
3	Design Aspects	16	24	67	Good enough / decent enough
Total Score	58	100	70,3	Good enough / decent enough	Total Score

Based on the results of the software expert's assessment above that in the aspect of originality the value obtained is 75% of the category "Good Enough / Fair Enough" to be continued to the next stage. The physical aspect scored 72.7% in the "Good Enough / Fair Enough" category. The design aspect scored 68% in the "Fairly Good / Fair" category. So that the average assessment of software experts is 72% in the category "Good Enough / Fair Enough" to be continued to the next stage after revisions are made as recommended.

**b. Results of Product Validation by Phase I Electronics Experts**



**Figure 1.** Results of Product Validation by Phase I Electronics Experts

Based on the results of the hardware expert's assessment above, in the aspect of originality, the value obtained is 75% in the "Good Enough / Fair enough" category to be continued to the next stage. The physical aspect scored 69.2% in the "Good Enough / Fair enough" category. The design aspect scored 67% in the "Fairly Good / Fairly Fair" category. So that the average

assessment of hardware experts is 70.3% in the category "Good Enough / Fair Enough" to be continued to the next stage after revisions are made according to what has been suggested.

**c. Result of 3 Stage I Expert Assessments**

Based on the results of the expert validation assessment in the diagram above, expert I (Sports Test and Measurement Expert) gives a value of 71.2%, which means that the digital-based volleyball skills test instrument is "Good Enough / Fair Enough". Expert 2 (Software Expert) gave a score of 72% in the "Fairly Good / Fairly Fair" category. Expert 3 (Electronic Expert) gave a score of 70.3% in the "Good Enough / Fair Enough" category. So that the average assessment of the 3 experts was 71.2% in the category of "Good Enough / Fair Enough" to be continued to the next stage after revisions were made as suggested.

Based on the above research results, the development of sensor-based coordination instruments is suitable for measuring the level of hand eye coordination. This tool is a development of a pre-existing tool where it does not use a piezoelectric sensor so that it often experiences errors when capturing an object or detecting an object. This sensor-based coordination test instrument is a new innovation in the development of existing instruments but has advantages from physical / component, software and hardware aspects. The following describes the novelty of the piezoelectric sensor-based coordination instrument tool., Sport technology has subsequently contributed greatly to the enhancement of epidemiology, prevention and management of injuries, management of non-communicable diseases, physical activity and sports performance so that from this study technology is needed. in sports and learning activities Paul, Y., & Ellapen, TJ so that this development resulted in[4]:

- a. The piezoelectric sensor-based coordination test instrument is an original product that has not been developed before.
- b. Sensor-based coordination test instrument software is designed very well so that it produces applications that are attractive and easy to understand for everyone
- c. The application features that are made are very interesting and easy for everyone to do
- d. The hardware for the sensor-based coordination test instrument is made using the best components and types of materials so that the strength and quality of the tool are both for use inside and in the outside field

#### **4. CONCLUSION**

The industrial revolution 4.0 demands that we continue to develop and innovate. One of the things that can be done in accordance with the field of science being pursued is the development of sports science. The science of sports is still adapting to the development of science and technology, where many sports have used science and technology in the training process and during the competition. The coordination test is done by throwing a catch ball. Test instrument for throwing and catching ball based on vibration sensor. Vibration sensor as a detection tool that is integrated into the computer. The implementation of the coordination test that is used manually can be done using a vibration sensor based instrument so that the calculation results can be more valid and the implementation of the test is more effective and efficient. This research can be used both for students, lecturers, researchers and institutions as a coordination test instrument during learning activities, exercises, or during the entrance screening for institutions.

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