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Plan Prototype Microcontroller based 30 Meter Running Speed Test Equipment

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Abstract

This research aims to produce a 30 meter running speed equipment product athlete North Sumatra which is microcontroller based. It is hoped that this research will be able to overcome the difficulties faced by testers which have so far been carried out manually so that they are effective and effective objectivity The results of this test still cannot be categorized as accurate. This research uses an approach of research and development with the Borg and Gall model which is divided into three stages. The research stages are; (1) Pre-development stage, which one At this stage, a needs analysis is carried out through survey level of tool requirements for users, preparation instrument and consultation to experts. (2) Development stage develop products running speed 30 meters starting from developing initial product manuscripts (manual books), designing digital tools, trials small group, stage I improvement, trials large group, phase II improvement, mass production. (3) Evaluation stage implementation of product results and dissemination product. The results of the analysis from the trial I obtained an average value implementation of Microcontroller-Based 30 Meter Running Speed Test Equipment based on data obtained for the answer "Yes" with a percentage of 81.38% and "No" with a percentage of 18.62%. The results of the analysis of trial II obtained an average value implementation plan prototype digital step frequency measuring test tool based on data obtained for the answer "Yes" with a percentage of 86.08% and "No" with a percentage of 13.92%. The conclusion in this research is that the test tool developed is valid because the calculation uses a digital system.

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INTRODUCTION

As we feel nowadays, the development of technology is so rapid that currently it makes people want to always create something creative and triggers them to create something new that can be applied and can be used effectively and efficiently (Imran Akhmad, 2018; Mesnan & Supriadi, 2022; Supriadi & Mesnan, 2022a, 2022b). Furthermore, the development of this technology has penetrated very vital aspects of human life, thereby stimulating all patterns think humans and is focused on the use of technology, including in the field of sports (Supriadi & Nopember Haloho, 2022; Zega et al., 2022). This is the basis for the importance of a generation that has new, more creative and innovative ideas in developing sports science and technology produced through research (Rizal et al., 2018). That's what it seems will become a generation that will be able to pass on the baton of sports science and technology development so that it can continue and be sustainable so that future hopes can be ensured that at times In the future, Indonesia can catch up with science and technology from other countries.

As we know, Medan State University is one of the universities that produces graduates at Bachelor's, Master's and Doctoral levels ready to be placed in various scientific fields. Realizing the quality of graduates who are ready to use Unimed sets the vision "to become a superior university in the fields of education, industrial engineering and culture". One of the leading areas is in line with Unimed mission in point three which reads "developing creative industrial engineering and technology". The meaning of this implies that Unimed will continue to direct research that is capable of producing innovative work on an industrial engineering scale in all study programs.

In connection with the Unimed mission which is related to industrial engineering, it is still minimal, especially at the Unimed Faculty of Sports Science (FIK) and there is very minimal research related to sports science and technology. The conditions above also explain that the rapid development of technology currently makes people want to always be creative in making something new breakthrough that can be applied and can be used by the general public effectively and efficiently. The development of this technology has penetrated all vital aspects of human life, thereby stimulating a mindset focused on the use of technology, including in the field of sports. This is the basis for the importance of the next generation of the Indonesian nation having new, more creative and innovative ideas in advancing sports science and technology that are produced and based on research.

Considering the rapid role of science and technology in the progress of sports, research should be able to produce appropriate technological products to help sports players improve the performance of athletes and ultimately advance sports at both national and international levels. The application of sports science and technology generally leads to the field Sport Industry, Techno Sport and Sport Science. and this is the basis for the importance of research to develop sports science and technology immediately, in the process collaboration between sports practitioners and academics and experts in various fields is needed. One of the science and technology products is prototype, which requires collaboration between sports academics and experts in the field of technology to produce digital sports equipment that is more effective, efficient and objective. One of the science and

technology products that will be produced in this research is a tool for measuring 30 meter running speed.

Carrying out physical tests on athletes is a test to determine how far the athlete's physical condition is from the category of a professional athlete. The speed test is an item of physical testing carried out by athletes in North Sumatra. Apart from that, there are also many speed tests that are tested, one of which is the 30 meter running speed test, which is the most important part of the series of tests carried out. In its implementation, the running speed test with a distance of 30 meters has so far been carried out manually, so it is still not objective for recording the results carried out by the tester. This is because the 30 meter running speed test is still manually calculated using the stopwatch used by the tester.

The basic problems that occur in the implementation of the 30 meter running speed test carried out by the tester are (1) the tester's level of readiness in taking the implementation time is not the same as other testers, (2) the tester's understanding of pressing the start and finish stopwatch is still different from the movements carried out by athletes, (3) the results of tests carried out by athletes are not objective and not transparent. Considering the importance of test equipment for measuring athletes' running speed, the accuracy of the test equipment is very important so that the test results are objective and transparent. In its implementation, it turned out that it was carried out manually with less objective results which were carried out using a stopwatch. This condition is an obstacle and problem for researchers so that they can carry out research on the development of a 30 meter running speed test tool using digital calculations and minimizing the occurrence of errors made by testers. This product is designed to make it easier for testers to find out the extent of an athlete's 30 meter running speed and is an accurate and objective based microcontroller with motion sensor. The way the tool works is that the microcontroller and motion sensor are installed parallel to the start line and finish line, and later the results of the athlete's 30 meter running speed test will appear on the Android held by the tester.

By developing the prototype, it is hoped that Unimed will become one of the State Universities that directs research more towards sports science and technology so that it can be independent and able to catch up in the field of sports science and technology and can also improve sports achievements in Indonesia and build better national sports. One of the benefits of sports technology products is to make it easier to carry out tests measuring athletes' 30 meter running speed. Research that is relevant to the title that the researcher raised (Herman et al., 2021) Research and development research related to the development of automatic time recording in this research, shows that automatic time recording can be made at an economical price, and can be used to measure the speed of a 60-meter run. Further development regarding the maturity level of precision and accuracy of this prototype is needed in order to produce a good measurement tool for athletes, coaches and other sports practitioners. (Rahmat et al., 2016) A microcontroller-based running speed measuring instrument with personal computer interfacing is made with a microcontroller-based electronic circuit. This tool uses a phototransistor sensor which will detect obstacles or runners that pass through the sensor. This tool uses cables as a data transfer communication function. Display running results using a sprint monitoring

application created using Visual Basic software. From several of these studies, the researchers tried to create a product design for a microcontroller-based 30 meter running speed test tool.

METHODS

This research uses an approach Research and Development or development research by Borg and Gall (Sugiyono, 2010) which will be grouped into 3 stages, the stages are (1) Pre-development stage, which one At this stage, a needs analysis is carried out through surveys of the level of tool needs for users, preparation of instruments and consultation with experts. (2) The development stage develops the product 30 meter running test equipment starting from developing the initial product manuscript (manual), designing a digital 30 meter running test equipment, small group trials, phase I improvements, large group trials, phase II improvements, mass production. (3) Evaluation stage of implementation of product results and product dissemination. In carrying out research, data is collected through observation, interviews and document study, where documentation is carried out to record objects in the field that are difficult to narrate. Meanwhile, document studies are carried out to collect data contained in relevant documents as material for product preparation.

Preliminary Manuscript Formulation

The initial drafting of the text was carried out through FGD by experts including; sports practitioners, provincial administrators, North Sumatra KONI administrators, and Disporasu. Meanwhile, data analysis techniques use: (1) percentages to see the level of product needs and (2) expert validation using qualitative studies with triangulation. In the implementation, data collection on the results of draft trials or initial product manuscripts and product test equipment was carried out through questionnaires to see the effectiveness of the product on small groups of 50 samples using a percentage approach. Analysis of trial I data was used as a basis for product improvement for phase II trials. Next, in phase II trials, data collection was carried out on 75 samples using presentation and qualitative techniques. The results of phase II trials are used as the basis for phase II product results that are ready to be implemented. The product of this research

RESULT

The achievements that have been obtained in this research have resulted in a design Prototype Microcontroller-Based 30 Meter Running Speed Test Equipment which will later become a test tool for athletes and this test tool will later be able to find out how fast the 30 meter sprint test is produced when running a sprint, further in this research using research methods research and Development or development research adopted from Borg and Gall and grouped into three stages. From the results of observations, current trends are occurring, namely research that produces products, which are useful for adapting development revolution Industry 4.0 is very fast, especially in the world of sports. As a manifestation of the rapid implementation of IT development, the 30 meter sprint speed test is not yet available. Furthermore, based on the results of the initial survey and needs analysis, it shows that there is no such thing tool The test that can measure the speed of running 30 meters is based on a microcontroller so that from the needs analysis carried out on coaches, 85% of them need a tool that can calculate the sprint speed carried out by sprint athletes to find out how fast the athlete sprints. In this regard, a test tool is needed that can

measure stride frequency in sprint athletes.

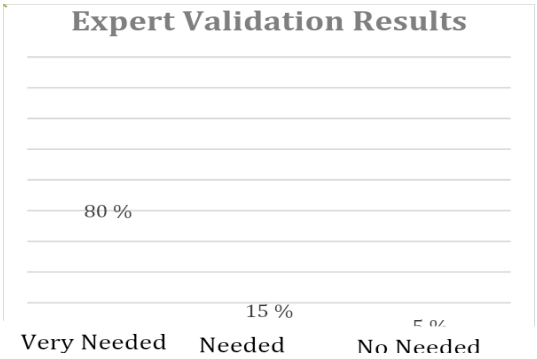

Figure 1. Expert Validation Result

The design of the prototype for a microcontroller-based 30 meter running speed test tool was carried out in three stages in the research process, namely (1) Pre-development stage, which one At this stage, a needs analysis is carried out through surveys of the level of tool needs for users, preparation of instruments and consultation with experts. (2) Development stage develop products sprint athlete's step frequency test starting from developing the initial product manuscript (manual), designing digital test equipment, small group trials, phase I improvements, large group trials, phase II improvements, mass production. (3) Evaluation stage implementation of product results and product dissemination. The results of the validation and response to the prototype design of a microcontroller-based 30 meter running speed test tool showed that 80% said it was really needed, 15% said it was needed and only 5% said it was not needed.Based on the results of this survey it can be believed that the design prototype A microcontroller-based 30 meter running speed test tool is really needed.

The data obtained in this research is presented in percentage form.The questions asked consisted of 40 statement items that used 2 alternative answers "Yes" or "No" with a score of "Yes=1" and "No=0". The following are the results of a survey analysis of the Prototype Design of a 30 Meter Running Speed Test Equipment Based on a Microcontroller which was located in the research at FIK Unimed jl Willem Iskandar Pasar V Medan Estate with stage 1 trials on 20 athletes, stage 2 trials on 30 athletes.

Table 1. Athletes' desires for a prototype design for a microcontroller-based 30 meter running speed test tool

No	Of		No	
	Amount	%	Amount	%
1	34	85	6	15
2	33	82,5	7	17,5
3	27	67,5	13	32,5
4	28	70	12	30
5	30	75	10	25
6	29	72,5	11	27,5
7	29	72,5	11	27,5
8	31	77,5	9	22,5
9	33	82,5	7	17,5
10	36	90	4	10
11	30	75	10	25
12	37	92,5	3	7,5
13	30	75	10	25
14	37	92,5	3	7,5
15	35	87,5	5	12,5
16	38	95	2	5
17	29	72,5	11	27,5
18	35	87,5	5	12,5
19	35	87,5	5	12,5
20	35	87,5	5	12,5
Rate-rate	81,38		18,62	

The results of the analysis from trial I obtained the average value of the implementation of the Microcontroller-Based 30 Meter Running Speed Test Equipment based on the data obtained for the answer "Yes" with a percentage of 81,38 % and “No” with percentages 18,62 %. In bar diagram form the data is depicted as follows:

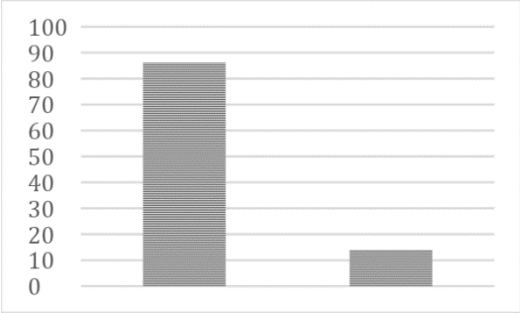

Figure 2. Design Desire Diagram Prototype 30 M Running Speed Test Equipment

From the average value of the athlete's first trial in designing a prototype for a microcontroller-based 30 meter running speed test tool based on data acquisition, this shows that the prototype design for a 30 meter running test tool is very popular with athletes.

Table 2. Athlete's desire for a prototype design for a microcontroller-based 30 meter running speed test tool in trial phase II

No	Of		No	
	Amount	%	Amount	%
1	36	90	4	10
2	38	95	2	5
3	38	95	2	5
4	33	82,5	7	17,5
5	35	87,5	5	12,5
6	35	87,5	5	12,5
7	29	72,5	11	27,5
8	32	80	8	20
9	39	97,5	1	2,5
10	31	77,5	9	22,5
11	33	82,5	7	17,5
12	32	80	8	20
13	36	90	4	10
14	30	75	10	25
15	37	92,5	3	7,5
16	30	75	10	25
17	37	92,5	3	7,5
18	35	87,5	5	12,5
19	37	92,5	3	7,5
20	36	90	4	10
21	39	97,5	1	2,5
22	33	82,5	7	17,5
23	36	90	4	10
24	38	95	2	5
25	30	75	10	25
26	34	85	6	15
27	29	72,5	11	27,5
28	35	87,5	5	12,5
29	35	87,5	5	12,5
30	35	87,5	5	12,5
Rate rate	86,08		13,92	

The results of the analysis of trial II obtained an average value for the implementation of the prototype design for the digital step frequency measuring test tool based on the data obtained for the answers "Yes" with a percentage of 86.08% and "No" with a percentage of 13.92%. In bar diagram form the data is depicted as follows :

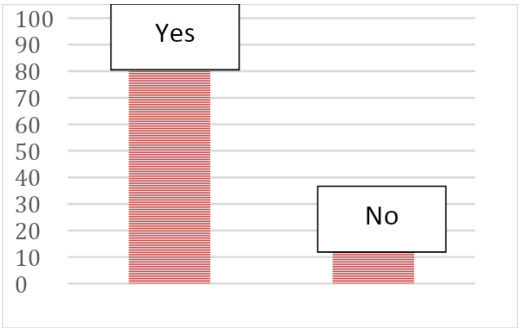

Figure 3. Diagram of Prototype Design

The results above obtained the average value of students' desires in athletes' desires for the Microcontroller-Based 30 Meter Running Speed Test Equipment Prototype Design based on data acquisition, which shows that the prototype design for the 30 meter running speed test equipment is very popular with athletes.

DISCUSSION

Based on the research results, a running speed analysis tool was obtained that was suitable for use for training. The product resulting from this research is an accelerometer-based running speed analysis tool. Validity in this research uses content validity. According to (Siswanto, 2008) content validity is validity based on expert opinion that the instrument is suitable for use as a data collection tool. Evidence of content validity is obtained by agreeing with experts (expert judgment), namely material experts and media experts.

(Mamesah, 2015 ; Rumini, 2012)t o increase the speed of a 30 meter sprint requires joint efforts in frequency, reaction speed and technique, including: (1) to increase the speed of a sprint, the frequency of an athlete's footsteps must always be done at the start of each training sessions and with more repetitions so that movement automation occurs quickly, (2) to increase sprint running speed, a runner's reaction speed must be increased by practicing reactions in various positions such as sitting, prone, standing and others such as concentration training on stimuli, namely through black and green game by moving with quick reactions to chase the opponent, (3) to improve the starting technique, you can do two point start exercises, namely both feet as a support, three point start, namely both legs and one arm as a support and finally with a block start namely with both legs and arms as support, with various signals such as clapping, whistles and others, (4) efforts to improve running techniques such as arm swings, knee lifts and body position are improved with exercises for arm swings using dumbbells and knee lift can be increased step hurdle training, and (5) efforts to improve the technique of crossing the finish line by practicing dropping the body forward from a standing position in alternate pairs. (Hadisman, 2021)) explains that there is a significant relationship between the explosive power of the leg muscles and the 60 meter running speed of Class V Boys at Sd Negeri 005 Pendalian. With a calculated R value (0.410). R Table is (0.410 > 0.400). Thus Ho is rejected and Ha is accepted. (Redi Rahmat, 2016) explains that the development of a microcontroller-based running speed measuring tool that has been developed is effective and efficient which can measure sprint running speed. (Kridasuwarso, n.d.) (Nurulfa, 2017).

The results of large group trials were evaluated by experts so that the 25 multilateral-based sprint training models were feasible and used to train elementary school children. The models developed were declared effective and usable. Based on the results of the comparison between the pretest and posttest given to students, the t count was 7.79 and t table = 1.695. (Agnes Sopiyah Maliza et al., 2023) The 20 meter sprint training was carried out for 6 weeks, 3 times a week. The results of the hypothesis test analysis determine t count (12.15) > t table (1.70), so that H1 is accepted and H0 is rejected, so it can be concluded that 20 meter sprint training can increase running speed. (Rumini, 2012) based on the results of research hypothesis testing that there is a significant influence between training methods, training forms and agility on: (1) 100 meter running speed, (2) step frequency (Wicaksono & Kusuma, 2021)) that physical speed training can increase sprint speed(Meitri ariyantini et al., n.d.) explains that running acceleration training can increase a person's ability to increase speed.

CONCLUSION

The 30 meter running speed test tool is an auxiliary tool in carrying out

physical tests which are often carried out by coaches and KONI North Sumatra so that it makes a greater contribution to an athlete's running speed results. 30 meter running speed is the number of steps a sprinter can take in a certain distance. So that the fast travel time in the 30 meter running test can be known without any misunderstanding between the coach and tester. So from this explanation it becomes a very basic problem where it is very important to have a 30 meter running speed test tool, in order to find out the time obtained by the athlete when carrying out the physical test. So with the Prototype Design of a 30 Meter Running Speed Test Equipment Based on a Microcontroller, coaches can easily know that an athlete has the talent to become an athlete when they want to carry out a physical test. The suggestions in this research are that later this research can become sustainable research to support Unimed vision to support changes in the industrial revolution 4.0 which demands research that can produce innovative work that includes industrial engineering for every study program within Unimed.

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