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Design Push Up DetectorUsing Quality Function Deployment Method and Anthropometry

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Abstract

Push-up is one of the techniques or ways of exercising that must already often done. But there are still many people who do not understand very well how to do push-ups right, most people just do that without realizing it will not generate benefits for our bodies. The purpose of this study is (1) Determine the criteria for consumers of a push up detector with Quality Function Deployment method and (2) To draft wake detection tool design push up athletics with automatic detection ergonomic. Results from this study is that there are 11 criterias in detector design push up and push-up design of the tool sensor detector height can range between 77-82 cm, this figure is taken from the value of percentile 5 to 95 percentile body dimensions vertikal reach. The length of the horizontal sensor between 88-92 cm. This measure is taken from sitting height dimensional.

Keywords : *Quality function deployment, Anthropometri, Push Up detector, Ergonomic*

1 INTRODUCTION

Anthropometric derived from "anthro" which means human and "metric" which means size. Anthropometric is a study related to the measurement of the dimensions of the human body [1]. Anthropometric fields include various sizes of the human body such as weight, position when standing, when stretched out arm, body circumference, leg length, and so on.

Anthropometric data are used for various purposes, such as the design of work stations, working facilities, and the design of products in order to obtain the measures appropriate and feasible with the dimensions of human limbs that will use it. In this study, anthropometric data used as the basis for design of push-up detector. This tool is necessary is designed considering this sport is a sport that is most often done well to lay and athletes. For this time the research is conducted anthropometric data taken from the athletes run, this is done because the araga run is the oldest sport and everyone can easily do this sport. The need for anthropometric data in the draft wake detector tool push up to avoid muscle injuries when doing push-ups with this tool.

Quality function deployment (QFD) method is used to collect expert opinion and voice of customer for product design [2].This method is expected to determine the priority in the push-up detector.

The objectives of this study were : 1) Determining priority for athletes to push up product detector, 2) obtain a measure for the design of an ergonomic push-up detector. Ergonomics has two main objectives, namely [1] : 1) Improve the effectiveness and efficiency of the work and other activities, 2) Increase the values of certain desirable jobs, including improving security, reducing fatigue and stress, improve comfort and job satisfaction as well as improve quality of life, and 3) Ergonomics applied to fulfill its intended destination in order to effectively and efficiently the human ergonomics teaches several approaches should be applied.

The advantage to implement ergonomics are : 1) The reduced number of occupational illness, 2) The reduced workplace accidents, 3) Medical expenses and compensation for reduced, 4) Occupational stress is reduced, 5) productivity improved, 6) Improved workflow, and 7) A sense of security because it is free from interference injury.

2 RESEARCH METHODHOLOGY

The study was conducted in Palembang and Sekayu. Anthropometric data measurement is taken in male athletes aged 18-23 years.

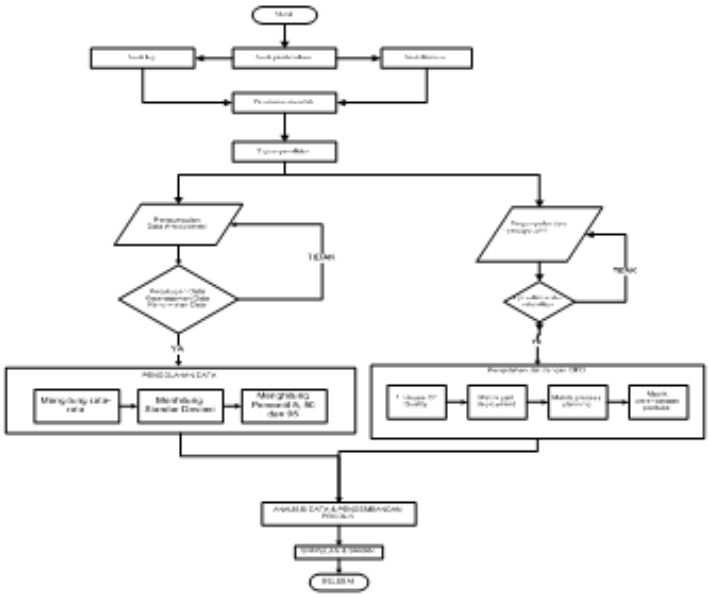

Figure 1: Research flow chart

Data collection is running two stages : 1) Distribution of the questionnaire for QFD, and 2) The collection of anthropometric data by means of direct measurement.

This research was made through several stages, namely : 1) The collection of data through questionnaires to the informant to determine detector push up the criteria that will be created, 2) Determine the design and size of the push-up detector with anthropometric data collection,

and 3) Spread a second questionnaire to prospective users of the push-up detector design that has been designed.

The image in figure 1 shows a flow chart of research and stages of collection and processing of data.

3 RESULTS AND DISCUSSIONS

3.1 Questionnaire Results Quality Function Deployment

QFD data collection method [2] is done by providing a number of questions to the speakers. Speakers in question are those who are experts in the design of products and push up the correct position. From the results of the data collection in the 11 attributes of push-ups get the detector are:

Table 1: Attributes Design Push Up Detector

No	Requirement
1	Selection of the type of sensor
2	Light
3	Lifespan economical material
4	Strength of materials
5	Comfort
6	Selection form
7	Variations size
8	Variations in color
9	Ease of use
10	Selection of materials
11	Multi function tool

Furthermore, the criteria that have been obtained is converted into a questionnaire to ask the prospective users push up detector.After the questionnaires were distributed and tested the validity of the reliability of the test result measuring instrument is Alphacronbah value = 0.823 [3] so that the measuring instrument is reliable.

3.2 Priority Result for Product Design Using QFD

Priority strived for the development of products is as follows : 1) Priority I (Option Type Sensor). An attribute that is easy to be realized because it can use the preferences of the competitors' products. While the technical characteristics that may affect its not good sensor: quality of materials, the quality of the sensor, and the quality function also does not conflict with other technical characteristics, 2) Priority II (Light). Push ups are a light detector includes attributes that affect the level of sales, since most consumers will buy a product tertatrik with a light-weight of the product. If the weight of the push-up detector is too heavy, so consumers were reluctant to have. For that as a designer to be responsive and always capture the desires of consumers by means of push-up detector design of lightweight material. The characteristics of which are closely related techniques are dried materials and

the quality of these materials, 3) Priority III (Ease of Operation). At ease with him a push up pengoprasional detector then sipengguna or consumers feel comfortable, and gives special value to the design and development planning tool detctor push ups, 4) Priority IV (Age Economical). It is still in the category that is easy to overcome, because of the preference of a competitor's product can be used as a reference, which in turn can re-evaluate the company against its products. But it will be a little in need of thought and a good experience when quality material can survive, 5) Priority V (Convenient Used). Type attribute indeed it is relatively comfortable for its user but through an assessment process that involves preferences so it can be used as a reference.

3.3 Anthropometric Data

Anthropometric term comes from "antro" which means human and "metri" meaning ukuran. In term of anthpometri can be expressed in general as a study related to the measurement of the dimensions of the human body. Humans will basically have the shape, size (height, width, etc.), weight and others are different from one another.

Anthropometry is a data set that is closely linked to the physical characteristics of the human body size, shape and strength as well as the application of these data handling design problem [1].

Anthropometric measurements of the body is static and dynamic. What is called enginerring anthopometri associated with the application of the data type of the body to design equipment that is used. Anthropometri divided into two parts : 1) static anthropometry, namely human measurements performed at rest and in a linear fashion on the body surface, and 2) dynamic anthropometric, ie measurement of the state of the physical and human characteristics in a state bergera, pay attention to movements that may occur when workers are doing business. Respondents in this study were 200 respondents consisting of track and field athletes from the region of Palembang and Sekayu. All respondents drawn is male aged between 18-23 years. This meant that the anthropometric data collected are homogeneous.

3.4 Uniformity Test Data Sufficiency and Data

Because the anthropometric data used in push-up detector only two dimension there are Reach Hand (JKT) and sitting height (TDT), then the processing of the data for the two dimensions are:

Table 2: Adequacy and Uniformity Test Result Data.

No	Dimension		x	BKA	BKN	N	N1	Description
1	JKT	77	1,62	75	84	200	2	Enough Data
								Uniform Data
2	TDT	89,91	1,28	85,86	95,16	200	1	Enough Data
								Uniform Data

3.5 Calculation of percentiles 5, 50 and 95

Percentile calculation is done to divide into segments of the population for the benefit of researchers. Use of percentile calculation is done with the following formula [4] :

5 percentile = X - 1.645

50 percentile = X

Percentile 95 = X + 1.645

The results of the percentile calculation are:

Table 3: Percentile values for Anthropometric

No	Dimension	5%ile	50%ile	95%ile
1	JKT	78	80,60	82
2	TDT	88	89,91	92

Push Up detector design results are as follows:

Figure 2: Push up Detector

4 CONCLUSSIONS AND RECOMMENDATIONS

The result from this research are :

1. The push-up detector is simply and easy tools to operate. The push up detector calculates the number of push-upusing the sensor corresponding to the correct push-up position.

2. The size of the dimensions of the tool has been adapted from the results of anthropometric data processing tailored to the user's body posture, thereby reducing the risk of fatigue and improve comfort and user satisfaction.

3. Based on the design , the push ups high detector sensor can range between 77-82 cm.

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