

# Validity and Reliability of Holding Bow Digitec Test

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## ABSTRACT

This study aims to: 1) determine the validity of the digitec holding bow test 2) determine the reliability of the digitec bow holding test 3) create a new breakthrough that the "Holding Bow Digitec Test" is a tool for measuring arm muscle strength and endurance with high validity and reliability for sports. archery. This research is a type of research and development (R&D) research that uses the Borg & Gall development model which consists of 10 procedures. The subjects involved in this study amounted to 33 subjects consisting of 18 male archers and 15 female archers. Data collection techniques using tests and measurements. . The validity test uses content validity which is analyzed using the Aiken's  $v$  formula and concurrent validity which is analyzed using product moment correlation. The reliability test used a test-retest approach which was analyzed using product moment correlation. The results of the study were a tool for measuring the strength and endurance of the arm muscles in archery called the "Holding Bow Digitec Test". The strength test is declared valid with  $r$  arithmetic  $>$  from  $r$  table, with details of  $0.961 > 0.344$ . The arm muscle endurance test was declared valid with  $r$  count  $>$  from  $r$  table, with details of  $0.895 > 0.344$ . The strength test was declared reliable with Cronbach's alpha value  $>$   $0.60$ , with details of  $0.978 > 0.60$ . The endurance test was declared reliable with Cronbach's alpha value  $>$   $0.60$ , with details of  $0.944 > 0.60$ .

**Keywords:** Validity, Reliability, Holding Bow Digitec Test

## 1. INTRODUCTION

The popularity of archery in Indonesia is motivated by the public's view that archery can train focus, concentration and improve one's physical fitness (Humaid, 2014; Hung et al., 2021). Archery itself is a static sport that requires good physical conditions, namely strength and endurance, especially in the upper body muscles (Fahrizqi et al., 2021; Hardi et al., 2020). Archery is a sport that requires, and balance, to form a good archery technique (Arkin & Slave, 2021; Bisht Assistant Professor et al., 2017). Archery is one of Indonesia's leading sports, because archery athletes from Indonesia are able to be competitive in prestigious events such as the World Cup Archery by successfully getting medals at the event (Ichsanudin & Gumantan, 2020). In addition, archery is a sport that often donates medals at multi-event events such as the Sea Game, Asian Games and made history as the first sport to win a medal for Indonesia, namely the silver medal at the 1988 Seoul Olympics (Raharjo, 2014). This is an attraction that makes this sport popular in Indonesia (Komarudin et al., 2021). By seeing this potential, the government

continues to search and develop archery talents in Indonesia by creating a coaching platform such as the Coaching of Talented Athletes (PAB), Pelatnas Prima Pratama, and also PPLP (Student Training Development Center) (Rumini & Rani, 2016). ). In this coaching, prospective talented archery athletes will be selected strictly, starting from their achievements, mental and physical abilities (F. et al., 2014; Pluncevic-Gligoroska et al., 2010). These components are predictors of future athlete success (Arya Putrawan et al., 2018; Burdukiewicz et al., 2016). An archer must develop certain muscles such as arm and back muscles that aim to stabilize his aim and body position (Bostanci et al., 2019; Singh & Singh, 2016). The coaching process must be supported by adequate facilities and infrastructure, a large field that has complete archery standards and equipment, and has special physical measurement tools for valid and reliable archery to support the process of coaching young archery athletes in Indonesia (Arief Parena et al., 2017; Pratiwi et al., 2021).

However, the problem faced in coaching centers is that the selection and coaching process is still not specific and valid for measuring arm muscle strength and endurance in archery athletes. In particular, it is measuring the strength and endurance of the arm muscles in archery athletes, because in the training center the majority still use instruments that are not yet valid for archery, namely to measure arm muscle strength using a pull and push dynamometer, push ups and using a drawn hanging scale. for arm muscle endurance using the "holding bow test" this test is done by pulling the bow and holding it and counting how long the archer is able to hold it. The weakness of the Pul and push dynamometer is that when measuring the strength of the arm muscles, the movements performed are not the same when the archer draws the bow, if using a hanging scale the tool is not yet capable.

This prompted researchers to be interested in going directly to the location, in fact, the situation where the archery athlete was pulling the bow because there were differences, namely from the shape and weight of the tool, while the bow holding test had a weakness that it was not standardized how many pounds of bow capacity were used to measure arm muscle endurance, usually between the construction centers using bows that differ in the weight of the pull. The use of non-standard measuring instruments will cause the measurement process to be less than optimal. By utilizing advances in science and technology, a test tool that is more modern and has clear units will be able to measure validly and reliably the strength of the arm muscles and the endurance of the arm muscles of archery athletes. .

Knowing the strength and endurance of an archer's arm muscles will also determine the selection of the right bow with the archer (Hung et al., 2021; Qiu & Zhao, 2019). The most important thing in choosing a bow is that the bow is suitable for the athlete in question, this means that the bow weight should not be too heavy or too light for the archer (Roldán et al., 2020; Tu et al., 2020) . So that the archer is able to draw the bow without exerting excessive force and without tension and is able to do it repeatedly without changing the anatomical shape of the technique (Ahmad et al., 2014; Cohen et al., 2018). High precision when performing archery techniques between one arrow and another is important to get a high score (Akınoğlu et al., 2020). To be able to match the bow with the wearer, every coach must be able to know the muscle strength and endurance of the athlete's arm (Arkin & Budak, 2021; Park et al., 2013; Tan et al., 2016).

**2. METHOD**

The subjects in this study were 33 archery athletes consisting of 18 male athletes and 15 female athletes with an average age of 20,21,22 and 23, as well as the occupation of the student subject. Uji validitas menggunakan content validity yang dianalisis menggunakan rumus Aiken's v dan concurrent validity yang dianalisis menggunakan korelasi product moment. Kemudian Uji reliabilitas menggunakan pendekatan test-retest yang dianalisis menggunakan korelasi product moment. Tempat penelitian ini adalah PPLP DIY. Durasi dalam penelitian ini adalah satu tahun yaitu 1 Maret 2018 – 1 Juli 2019. Product effectiveness test aims to determine the extent to which the product can achieve its goals. The effectiveness test was carried out by archery athletes from the Archery UKM of UNY and Perpani, Klaten Regency. There were 18 male athletes and 15 female athletes. The measurement results are presented in the table below.

**Measurement data using manual and digital tools**

Digital		Manual	
Kekuatan	Daya Tahan	Kekuatan	Daya Tahan
Tertinggi	25	24	25.4
Terendah	14	15	14.5
Jumlah Nilai	600	668	611,9
Rata-rata Skor	18,18	20,34	18,54

The data in the table shows that there are similarities between the average digital and manual results on tests of arm muscle strength and endurance. This shows that the digital arm muscle strength and endurance test results from the development of the manual arm muscle strength and endurance test are both in the good category. After passing the effectiveness test, this research will pass several homogeneity, normality and correlation tests. Correlations

In the process of testing the normality of two factors, namely the strength correlation test and the endurance correlation test. The test results of these two factors can be presented in the table below.

Paired Samples Correlations Strength			
	N	Correlation	Sig.
Pair 1 DIGITAL & MANUAL	33	,939	,000

Based on the normality test, it is known that the significance value is  $0.330 > 0.005$ , then the data can be concluded to be normally distributed. So it can be used to test paired samples correlation.

Paired Samples Correlations Durability			
	N	Correlation	Sig.
Pair 1 DIGITAL & MANUAL	33	,974	,000

The results of the product moment correlation test between the digital power and manual strength variables, the correlation test produces a sig value of 0.000. In accordance with decision making on the correlation test, if the sig value is less than 0.005 then there is a relationship between the variables being tested. Since the sig value is  $0.000 < 0.005$ , there is a relationship between digital power and manual power.

The results of the product moment correlation test between digital and manual endurance variables, the correlation test produces a sig value of 0.000. In accordance with the decision making on the correlation test, if the sig value is less than 0.005 then there is a relationship between the variables being tested. Since the sig value is  $0.000 < 0.005$ , there is a relationship between digital durability and manual durability.

This tool is a new technology that is easy to use, more accurate measurement results only require one person. The measurement data is also presented in digital form and stored in the device's memory and can be transferred to a computer. So that this tool is effective for measuring arm muscle strength and endurance in archery.

### 3. DISCUSSION

Product effectiveness test to find validity and reliability. Based on the effectiveness test to find the validity and reliability of the measuring instrument, it was found that the strength measuring instrument had a validity of  $0.961 > r$  table 0.344. The validity of the endurance is  $0.895 > r$  table 0.344.

So it can be concluded that the tool has validity for measuring arm muscle strength and endurance. Meanwhile, for strength reliability, the value of

Cronbach's alpha is  $0.978 > 0.60$ . Arm muscle endurance has reliability, namely the value of Cronbach's alpha  $0.944 > 0.60$ . Then it can be concluded that the test of arm muscle strength and endurance has reliability. The Holding Bow Digitec Test was also tested with the Paired Samples Correlations Test, which is to test whether there are similarities in the measurement results between the digital tools developed and the manual. The results of the Paired Sample Correlations Test of strength is a sig value of  $0.000 < 0.05$ , so it can be concluded that there is a relationship between the results of manual and digital strength measurements. The results of the Paired Samples Correlations test of endurance is a sig value of  $0.000 < 0.05$ , so it can be concluded that there is a relationship between the results of manual and digital endurance measurements. The Holding Bow Digitec Test weighs 2.9kg, while the standard archery range is between 2.5kg-3.5kg.

Holding Bow Digitec Test is a new innovation measuring tool that is more effective and easier in the process of measuring arm muscle strength and endurance. Limitations in this study relate to the research subject and the environment where the research is carried out. The limitations of this development research include: The limitations of theoretical studies on archery, where data collection is carried out in different places so that researchers have difficulty controlling each research environment, tests are carried out at different times, the condition of athletes when testing is different, only tests on 33 samples, and the measuring instrument is only intended for adult archery athletes.

### 4. CONCLUSION

It can be concluded that this research has produced a tool for measuring the strength and endurance of the arm muscles for archery sports properly. Arm muscle strength is measured in units (Kg), arm muscle endurance is measured in seconds. Based on the effectiveness test to find the validity and reliability of the measuring instrument, it was found that the strength measuring instrument had a validity of  $0.961 > r$  table 0.344. The validity of the endurance is  $0.895 > r$  table 0.344. So it can be concluded that the tool has validity for measuring arm muscle strength and endurance. Meanwhile, for strength reliability, the value of Cronbach's alpha is  $0.978 > 0.60$ . Arm muscle endurance has reliability, namely the value of Cronbach's alpha  $0.944 > 0.60$ . So it can be concluded that the test of arm muscle strength and endurance has reliability. Based on the limitations of product

dissemination development has not been carried out due to limited research time. For further development, this tool can be developed again so that it can be used by athletes of various ages by adjusting several components as needed, as well as looking for test norms that have been carried out.

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