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900 PUSH-UP TEST NORMS FOR SPORTS SCIENCE STUDENTS SULTAN IDRIS EDUCATION UNIVERSITY

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ABSTRACT: *900push up test is commonly used to assess the strength and endurance of the upper body. The purpose of this study is to build a 900 push up test percentile norms for Sports Science students from Faculty of Sports Science and Coaching, Sultan Idris Education University. 582 male students from major and minor programs of Sports Science Faculty were selected as study subjects. This study was conducted using a 900 push up test instrument, which was introduced by Baumgartner. Descriptive statistics data analyzed for mean, standard deviation, percentiles and percentages. Based on the criteria of FITNESSGRAM®, the results showed that all subjects (100%) were in satisfactory performance in strength and muscular endurance of the upper body (mean = 23:06, SD = 7:54) exceeds the predetermined criteria, ranging from 18 to 35 numbers of repetitions. Percentile norms for 900 push-ups test is normal with a score of 21 and above were in the 50 percentile. Therefore, proposed percentile norms from this study can be used to measure the upper body strength and endurance among Sultan Idris Education University students.*

KEYWORDS: 900 push-up test, arm and shoulder girdle strength and endurance, percentile norms

INTRODUCTION

90^0 push up test is one method that is often used in testing, measurement and evaluation of Physical Education and Sports Science to measure the strength and endurance of the shoulder. This test has also been proposed in FITNESSGRAM® physical fitness test battery to be used for measuring the strength and resilience of the muscles of the arm and shoulder (Cooper Institute for Aerobics Research, 2007). Baumgartner, Oh, Chung and Hales (2002), have successfully used the 90^0 push up test on the college students using a standardized testing protocol. They also estimate the objectivity, reliability and validity of the test protocol of 90^0 push up test and propose it to be acceptable to measure the strength and resilience of the muscles of the arm and shoulder for male college students (Baumgartner, Oh, Chung and Hales, 2002; Mozumdar, Liguori and Baumgartner, 2010).

Baumgartner, Hales, Chung, Oh, and Wood (2004), in their study obtained percentile norms for the 90^0 push up test based on the scores of 177 male college students. Percentile norms were described as helpful and easy to male college students. Based on the findings of Baumgartner, et al., (2004), this study focused solely on male students of Sports Science Program, Faculty of Sports Science and Coaching, Sultan Idris University of Education. Baumgartner et al. (2004) suggested that researchers or practitioners of the sport will come to continue to develop norms and percentile test scores in the 90^0 push up test among college students. Mozumdar, Liguori and Baumgartner (2010), suggest that additional studies with larger sample sizes are needed

to establish universal norms and standards for test scores and percentile norms for the 90^0 push up test on college students. The purpose of this study is to develop a test percentile norm for the 90^0 push up test among male students of Universiti Pendidikan Sultan Idris and see the difference between these norms and the norms that have been developed by Baumgartner et al. (2004) and Mozumdar et al. (2010). Various test methods have been adopted by teachers of Physical Education and Sports Science to measure the strength and endurance of the upper body. By using a variety of test methods without reference to any norm criterion standard, the strength and endurance of the upper body in male university students cannot be determined with precision. With a battery of tests with the norm generated by FITNESSGRAM® (Cooper Institute for Aerobics Research, 2007) at least it can help and widely be used among practitioners of Physical Education at the present times.

90^0 push up test was intended to be used to measure the strength and endurance of the upper body in FITNESSGRAM® test battery (Cooper Institute for Aerobics Research, 2007). Baumgartner et al. (2004) and Mozumdar et al. (2010), have also used the push up test that seeks to measure the strength and endurance of the upper body and managed to produce norms percentile. Some items should be identified in the testing procedures of 90^0 push up test, which is the area placed hand in hand with all fingers toward the future, the type of clothing the individual during the test which will affect test scores and behavioral test methods. FITNESSGRAM® (Cooper Institute for Aerobics Research, 2007), has issued a specific testing protocol that is 20 times 'cadence' read in one minute.

LITERATURE REVIEW

Test alteration of 90^0push up test is still in use in the education system in Malaysia to assess the strength and endurance of the upper body of students in schools, colleges and universities. 90^0 push up test battery used in the Energy Force Test Base (UDTA) and has been introduced in all schools in Malaysia since 1979 to measure the strength and endurance on the part of the student body. The next test of push-ups to 90 degrees was also adopted in the test battery SEGAK and was introduced in 2005 and used until now. Procedures and norms of 90^0 push up test which is used for both the adoption of this test was modified from the western countries. Until now practicing sport and physical education, teachers and university lecturers in Malaysia do not have a norm reference of test alteration of the 90^0 push up test that can be used to assess the strength and endurance of the upper body. Most of the lecturers of Sports Science and Physical Education are currently only using the test reference norms alteration of 90^0 push up test based on Prudential FITNESSGRAM® (Cooper Institute for Aerobics Research, 2007). Shephard and Trudeau (2005), conducted a study of muscle strength and endurance of the upper body among 456 students in Canada. The results showed that the experimental group has higher levels of strength and endurance in the upper body than the control group. This means training or physical education curriculum systematically needs to improve and towards maintaining muscular strength and endurance. This finding is supported by studies of Michael and Kenneth (2005), whereby they have made a comparison of the strength and endurance of the students who are active in sports with regular students who undergo Physical Education. A study of 120 males and 67 females shows that students who are active in sports have higher levels of strength and endurance than normal students do. The Health and Physical Education teachers should be exposed to and focus on how to measure the performance of children in terms of increasing the level of physical fitness.

Baumgartner, Hale, Chung. Oh, and Wood (2004), provided a test percentile norms alteration for the 90^0 push up test based on scores on 177 male students and 274 female college students. The mean age of male and female students is between (Mean = 19:41, SD = 2.4) years (mean = 18.9, SD = 1.9) years. Mozumdar, Liguori and Baumgartner (2010) did a similar study on college students to make comparisons between the percentile norms conducted by Baumgartner, Hale, Chung. Oh, and Wood (2004). However, these findings still get a score of zero for male and female students at a college in the fifth percentile. Custom test percentile norms of 90^0 push up test established by Baumgartner et al. al. (2004) and Mozumdar et. al. (2010), found that male college students' test scores increased somewhat smaller with increasing percentile. Thus, for male college students, percentile norms can be used with reasonable confidence. However, the large

sample size in a study could give an advantage (Baumgartner et al., 2004). Reviews by Mozumdar, Liguori and Baumgartner (2010) found that male students' test scores, even though the 90^0 push up test is the same between the two studies, but the values of the mean and median are closer to each other. The finding among male students, in the study of Baumgartner et al. (2004) and Mozumdar, Liguori and Baumgartner (2010) showed a relatively constant value from the lowest to the highest percentage. For male students, 16 of the 20 percentile values are in good scale (the score 3 to each other). Design: There is some disagreement on the score and percentile rank (100th, 95th, 10th, and 5th). The results of their study showed female students in scale score 3 into position percentile from 5 to 20. Fitness Study on children and youth nationally, Ross, Dotson, Gilbert, and Katz (1985) have confirmed that more than 60% of women aged 10 to 18 years obtain a score of zero for the 90^0 push up test. Reiff, Dixon, Jacoby, Spain and Hunsicker (1986) also showed similar results where 45% of males and females aged 17 years and above have received scores of zero for the test subject Gayut elbow bent. Field tests are not able to identify individual differences among students who have muscular strength and muscular endurance of the upper body at low levels. A test can be considered to have high reliability and good when the test was successful in reducing the difference of score and no subject who scored zero in the test alteration of 90^0 push up test.

Rose, Pate, Delpy, Gold, and Silvar (1987), felt that a custom test pull-ups and 90^0 push up test is more suitable for field trials to test the strength and endurance of the upper body compared to other tests. This is because the test custom pull-ups and 90^0 push up test give a better score rate at which the body weight is supported and is less common than the score of zero. Therefore, these tests can distinguish the level of ability between the strength and endurance of the upper body to produce students with a wide range of scores. Engelman and Morrow (1991) and Cotten (1990), report that their study found that only about 2% of boys and 3% of girls who have received scores of zero for the 90^0 push up test. McManis, Baumgartner, and Wuest (2000), reported that intraclass reliability estimate for a single trial in 90^0 push up test was 0.64 for girls and 0.71 for boys. 90^0 push up test and test custom pull-ups, which were accepted to test the strength and endurance of the upper body, found almost all studies reported reliability using reference framework norms. Kollath et al. (1991) studied the reliability of test reference norms and re-test to 90^0 push up test with various reference standard criteria. Standard reference criteria are in line with the standards of FITNESSGRAM® (Cooper Institute for Aerobics Research, 2007). There is no common reference standard criterion used by Kollath et al. FITNESSGRAM® standards (Cooper Institute for Aerobics Research, 2007) for men. The 90^0 push up tests and custom pull-ups test is widely used by practitioners around the world in Physical Education to gauge the strength and endurance of the upper body. However, the reliability of the equation between the two measurements in the upper body strengths was not reported before.

Baumgartner et al. (2003); Safrit and Wood (1995); and Morrow, Jackson, Disch and Mood (2000), say that the acceptance of objectivity, reliability and validity is needed to interpret test scores. The objectivity of the good is a prerequisite for good test reliability (Baumgartner et al., 2003). Baumgartner et al. (2003) explains that the three basic approaches to the validity is logical validity, criterion validity and construct validity. To test the validity of the accepted logical that Baumgartner Modified Pull Up (BMPU) as very similar to the traditional pull-up test, in which the performer is required to draw the whole body upwards until your chin over the bar and straighten the arm back to the original position this time. The difference between the traditional pull-ups with BMPU is easy to do because almost 100% of body weight was on board. Construct validity can be calculated when the score of male and female subjects better than female subjects, college students score is better than the scores of secondary students or groups who have been trained score better than the group that did not receive training in BMPU.

METHODOLOGY

This study aimed to develop a test percentile norm for 90^0 push up test in males in the major and minor programs of Sports Science, Faculty of Sports Science and Coaching program. This study is quasi-experimental in which data is obtained through practical testing in the field. All selected subjects were male students, from major and minor programs, who are currently enrolled in a bachelor's degree offered under the

Faculty of Sports Science and Coaching at the Sultan Idris University of Education. Data in this study were obtained by the 90^0 push up test, which was introduced by Prudential FITNESSGRAM® (Cooper Institute for Aerobics Research, 2007).

The study sample

A total of 582 male students were selected as study subjects. The purpose of this study is to develop a custom test norms and percentile score of 90^0 push up test for Sports Science Program major and minor students, Faculty of Sports Science and Coaching, Sultan Idris Education University to compare them with the norms of the existing percentile (Baumgartner et al. , 2004 and Mozumdar et al., 2010). According to Morrow, Jackson, Disch, and Mood (2005), the sample size needed for the creation of a norm should be at least 200 people for each variable. Baumgartner et al., (2004), Safrit and Wood (1995) explains that the size of the sample to form a norm has to be large. Baumgartner, Jackson, Mahar, and Rowe (2007), also suggested that the sample size required is a few hundred students.

Measuring Instruments

Strength and endurance of the upper body is measured using 90^0 push up test, which was introduced by FITNESSGRAM (Cooper Institute for Aerobics Research, 2007). The validity of 90^0 push up test for male college students reported, r = 0.64 to r = 0.71 (Romain & Mahar, 2001), while the reliability for custom push-ups 90^0 test for college students has been reported ; men, r = 0.99 (Romain & Mahar, 2001). Validity and reliability of 90^0 push up test is adopted and reported by a specialist in Physical Education as a test with consistent procedure (Baumgartner (2002); Safrit & Wood (1995) and Romain & Mahar (2001).

Data analysis

Data was analyzed using SPSS for Windows ver.14.5. Descriptive statistical methods used to obtain the mean, standard deviation, percentage and percentile.

RESULTS

A total of 582 male students of major and minor programs of Sports Science, Faculty of Sport Science and Coaching, Sultan Idris University of Education were randomly selected for the study. All subjects were aged between 20 and 26 years.

Descriptive information on the 90^0 push-up test

Descriptive statistical analysis of mean and standard deviation of the entire 90^0 push up test showed that the mean score and standard deviation for the entire male student was (M = 23:06, SD = 7:54). Table 1 shows the descriptive statistics of test scores of the 90^0 push up test to the latest research, studies Mozumdar et al. (2010) and the study of Baumgartner et al. (2004). In this study, the minimum test score of the 90^0 push up test is 3 compared to the study by Mozumdar et al. (2010) and the study of Baumgartner et al. (2004). The minimum score is 0. Mean and median for 90^0 push up test for male students in this study had no significant similarities. The skewness statistic for this study 90^0 push up test showed -.069; lower than the study conducted by Mozumdar et al. (2010) and Baumgartner et al. (2004).

Table 1: Descriptive Statistics for Score 90^0 Push Up Test

	Ahmad et al. (2004)	Mozumdar et al. (2010)	Baumgartner et al. (2004)
	Male	**Male i**	**Male**
N	582	418	177
Mean	23.06	24.1	22.1
Median	23.00	23.0	23.0
SD	7.54	11.0	11.1
Minimum	3.00	0	0
Maximum	46.00	64	48
Skewness	-.069	0.3	-0.2

Table 2: The Percentile Rank 90^0 Push-Up Test for Male

	Male (N=582)	
Percentile	Skor	Total
100	46	26
95	39	31
90	36	8
85	32	47
80	31	27
75	29	10
70	28	40
65	27	35
60	25	10
55	23	49
50	21	23
45	20	37
40	16	16
35	15	23
30	12	31
25	9	59
20	8	18
15	7	34
10	6	24
5	3	34

Table 2 shows the findings of this research which indicate the number of scores of 21 and above for a 90^0 push up test is ranked 50 percentile and above. This means a total of 306 students from the entire sample of 582 people have successfully performed in the 50 percentile and above. No student who scored `0' in the lowest percentile 5 scores obtained in the 90^0 push up test is the score of" 3 ". The highest score on percentile ranking of 100 in this study is '46'.

The analysis in Table 3, shows that overall male students pass 100% based on the criteria set by FITNESSGRAM® (Cooper Institute for Aerobics Research, 2007).

Table 3: 90^0 push-up test scores based on FITNESSGRAM®

Age (Year)	90^0 Push-Up	% Pass
17	18 hingga 35	-
>17	18 hingga 35	582

Table 4, shows the scores of 21 and above for a 90^0 push up test is ranked at 50 percentile and above is almost equal to the results of the study by Baumgartner et al. (2004) and Mozumdar et al. (2010), which respectively show score 23 and above for a 90^0 push up test in the 50 percentile and above. In a study conducted by Baumgartner et al., (2004) the highest frequency test scores for 90^0 push up test is the score `0 'on the 5th percentile and below.

Table 3: Percentile Norms 90^0 Push-Up Test

Percentiles	Ahmad et al. (2014) (N=582)	Baumgartner et al. (2004) (N=177)	Mozumdar et al. (2010) (N=418)
100	46	48	64
95	39	40	44
90	36	36	39
85	32	34	35
80	31	32	33
75	29	30	30
70	28	29	30
65	27	27	28
60	25	26	26
55	23	25	25
50	21	23	23
45	20	21	22
40	16	20	20
35	15	17	20
30	12	16	18
25	9	15	17
20	8	13	15
15	7	10	13
10	6	6	10
5	3	0	7

The lowest score in this research is '3' percentile ranked fifth, while the lowest score "7" in the study Mozumdar et al. (2010) is located in the 5 percentile.

DISCUSSION

The performance level endurance and strength in the upper body of the male students from the major and minor programs of Sports Science, Physical Education, Sports Coaching, Sports Psychology and Sports Rehabilitation, Faculty of Sport Sciences, Sultan Idris University of Education based Prudential FITNESSGRAM® is very satisfactory. The analysis showed that the boys managed to pass 100% based on the criteria established for muscle endurance and strength in the upper body (score 18 to 35). This finding is similar to a study conducted by Yusof Ahmad and Ahmad Hashim (2010). Most people assume that physical

activity and physical fitness are directly related, but the fact is that it represents different things. Physical activity is related to attitude, while physical fitness covers the nature or character of a person. Physical activity can contribute to physical fitness, but the relationship is not as expected.

The analysis also shows the percentile norm among male students in the major and minor programs of Sports Science compared with the results of the study by Baumgartner et al. al. (2004) and Mozumdar, Liguori and Baumgartner (2010), shows not much difference. The 100 percentile for male students in this study were scored 46 against Baumgartner et. al. (2004), whose score was 48 and Mozumdar, Liguori and Baumgartner (2010) whose score was 64. The 75 percentile for male students in this study were scored 29 against Baumgartner et. al. (2004) and Mozumdar, Liguori and Baumgartner (2010) whose score is 30. The 50 percentile for male students in this study were scored 21 against Baumgartner et. al. (2004) and Mozumdar, Liguori and Baumgartner (2010) whose score is 23. The 25th percentile for male students in the study was given a score of 10 compared to Baumgartner et. al. (2004) with a score of 15 and Mozumdar, Liguori and Baumgartner (2010) with a score of 17. The 5 percentile for male students in this study were scored 7 against Baumgartner et. al. (2004) with a score of 0 and Mozumdar, Liguori and Baumgartner (2010) with a score of 7.

CONCLUSION

The results of this research will provide useful feedback to the lecturer and tutor at Sultan Idris Education University, who were involved in various sporting activities and on testing the procedures of 90^0 push-ups test and can use the test percentile norms of 90^0 push-ups test as a reference in determining strength and endurance of the upper body for boys from major and minor programs such as Sports Science, Physical Education, Sports Coaching, Sports Psychology and Sports Rehabilitation in Faculty of Sport Sciences. The results of this study will also provide useful feedback to the trainers to identify the students in terms of the strength and endurance of the upper body. Based on the information from this study, lecturers or trainers will be able to make improvements in the curriculum of training programs related to the strength and endurance of the upper body.

FUTURE RESEARCH

The researchers suggest that future researchers be able to continue this study on a group of students who are more involved, both men and women across the Sultan Idris University of Education on percentile norms. This is because each percentile norms developed is suitable and can be used for five years. The findings of this study are expected to provide insights and useful guidance to lecturers, teachers of Physical Education and Sports Science teachers about the importance of a 90^0 push-ups test to increase endurance and muscle strength in the upper body among students.

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