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Influence of selected physical variables on the performance of national level judokas

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Abstract

The purpose of the study was to determine the physical variables as determinants of judokas at national level. The study was delimited to 50 national level male judo players between the age group of 18-27 years. The study was further delimited to the following variables: a) Physical variables: Grip Strength, Abdomen Strength, Shoulder Strength, Leg Strength, Strength Endurance, Reaction Ability and Agility. For the purpose of data analysis, researcher has used the statistical software known as SPSS version 20 and to find out the variables which are responsible for the performance of the judokas factor analysis was used to understand the structure of variables. The mean and standard deviation of all the variables were found for the selected test i.e. Abdomen strength test (56.20 + 8.88), Shoulder strength test (19.46 + 4.15), Grip strength test (44.09 + 6.69), Leg strength test (168.34 + 16.15), Strength endurance test (34.62 + 3.91), Reaction ability test (8.23 + 0.60), Agility test (9.99 + 0.60).

Keywords: physical variables, national level, judokas

Introduction

Competitive judo can be described as a combative, high intensity sport in which the athlete attempts to throw the opponent onto his/her back or to control him/her during groundwork combat. Both attempts depend on specific techniques and tactical skills with the support of good physical fitness. Since 2003 the format of international judo competition has been one continuous 5-min period, which can be complemented by extra time until one athlete scores or to the end of the new 5-min period (IJF website, 2004). However, during the time allowed, there are many interruptions during combat. The typical time structure is 30 seconds of activity with a 10 seconds interval.

The physiological demands of this format tax both the aerobic and the anaerobic systems. The anaerobic system provides the short, quick, all out bursts of maximal power during the match, while the aerobic system contributes to the athlete's ability to sustain effort for the duration of the combat and to recover during the brief periods of rest or reduced effort. Judo is a weight-classified, high-intensity combat sport where the athlete attempts to throw the opponent onto his/her back or to control him/her during groundwork combat. Additionally, judo athletes are classified according to their ages and compete in international level tournaments (e.g., World Championships) in the following age divisions: cadets – under 17 years-old; juniors – under 20 years-old; and seniors – above 20 years-old. It is known that judo players usually try to maximize muscle mass and to minimize adiposity in each weight category, and this process starts at the early adolescence in an attempt to increase power-body mass ratio.

Methodology

Selection of subjects

The purpose of the study was to find out the influence of selected physical variables on the performance of national level judokas. The study was delimited to 50 national level male Judo players age ranged from 18-27 years. The study was further delimited to following variables:

Selection of physical variables

Grip Strength, Abdomen Strength, Shoulder Strength, Leg Strength, Strength Endurance, Reaction Ability, Agility.

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Criterion measures

Measure the Grip Strength. Grip Dynamometer was used, Score Sheet and Pencil. The Grip strength of the left and right hand of the Judoka were measured by using Grip dynamometer. However, the best strength score were taken for analysis purpose. The concave edge of the grip of the dynamometer was placed between the first and second joints of the fingers with the dial towards the palm. The subjects were allowed any type of movement while squeezing the instrument; provided they were not hit any object with their fists. Scoring: The score of grip strength were recorded in the nearest kg.

Abdominal Strength was measured through Stop Watch, Score Sheet and Pencil. Abdominal strength was measured by using bend knee sit-ups. From a supine lying position the subject flexed his knee over the yard stick while sliding his heels as close to his seat as possible. The yard stick was held tightly under the knees until the subject as instructed to slowly side his feet forward. At the point where the yard stick drops on the floor, the tester marks the heel and seat line in order to indicate how for the seat should remain from the heel during the bent knee sit – up exercise. The fingers of the subject were interlock behind the neck and perform the sit-ups elbow touching the knees at the completion of the sit – up. Scoring: The sit-up performed correctly counted as maximum number of repetition in one minute.

Shoulder Strength was measured with the Stop Watch, Score Sheet and Pencil. Shoulder strength was obtained by administering the pull-up test on a horizontal bar of three centimeters diameter fixed at a convenient height, so that the subject's feet did not touch the floor while he was hanging with the arms straight. From this hanging position he pulled himself up until the chin was above the bar and instructed to avoid kicking and jerking movements. Total numbers of correctly executed pull – ups were considered as the scores for shoulder strength. Scoring, Maximum number of repetitions in one minute.

Leg Strength was measured through Leg Dynamometer, Score Sheet and Pencil. Leg strength of the Judokas was measured by using Leg dynamometer. The subjects were requested to stand erect on the base of leg dynamometer, feet placing parallel about six inches apart. The subject hold the bar with both hands together at the centre, both palm towards the body, so that it rests at the junction of the thighs and trunk. The fastening belt was placed as low as possible over the hips and gluteus muscles and knees slightly bent. From this position, he pulled the bar of the dynamometer up, expending the knees. Scoring: The score of leg strength were recorded to the nearest kg. Read the result from the Leg dynamometer in kg.

Strength Endurance was measured through Judo Mats, Judo Dress, Stop Watch, Score Sheet and Pencil. Start the throw with a strong pull from the hand controlling the sleeve of uke. This kuzushi will pull uke close and keep him from retreating as you enter for the throw. The sleeve pull should also lift uke's elbow up and out to open uke up for the attack. As you step in with your first foot to begin the pivot, your hand will enter under uke's arm until your upper arm and shoulder are locked tight against uke's armpit. Complete your pivot facing the same way as uke, knees bent so that you are considerably lower than uke, with your feet between or in front of uke's feet. Continuing your pull, now with both hands, uke should be completely on your back. As you bend forward and drive with your legs, you also rotate your shoulders and project uke forwards over your shoulder. Scoring: Maximum number of Ippon-Seoi Nage complete techniques in one minute.

Reaction Ability was measured through Stop Watch, Score Sheet, Pencil, Coins and Cups the subject was asked to stand on the starting line with his back to the cups and a penny (coin) in one hand. At the starting signal he turns and runs towards the cups. As he crosses the signal line, he was given a direction signal by the tester. He continues to the cup indicated by the direction signal and places the penny in that cup. The direction signal was one of three commands: 'red'; 'white' and 'blue'. The test was repeated four times. The time elapsing between the starting signal and the sound of the penny striking in the cup was measured with a stop watch and total time for each of the four tests constitute the score. Starting line to signal line distance is 8 feet and signal line to end line distance 16 feet. All three cups were placed between gape of 5feet. Scoring: The total score of all four tests is the score of an individual in seconds.

Agility was measured through Stop Watch, Score Sheet and Pencil Procedure: Subjects were asked to stand at starting line and to take start at signals/clap. The subjects were asked to complete the 40 meter distance (10x4) shuttle run in minimum time as much as they can. The scholar recorded the time with the help of stop watch from starting to finish. Scoring: Agility was measured in Second.

Statistical technique

The data analysis has been carried out by using statistical software (SPSS 20 version) and to find out the variables which are responsible for the performance of the judokas factor analysis was used to understand the structure of variables. There are some important assumptions for applying the factor analysis, they are as follows:

- Sufficient sample size has been taken for factor analysis. Normally Sample size must be equal to 5-20 times the number of variables taken in the study.
- Bartlett's Test of Sphericity.

Table 1: Descriptive statistics

Variables	Mean	Std. Deviation	Analysis N
Abdomen strength	56.20	8.88	50.00
Shoulder strength	19.46	4.15	50.00
Grip strength	44.09	6.69	50.00
Leg strength	168.34	16.15	50.00
Strength endurance	34.62	3.91	50.00
Reaction ability	8.23	.60	50.00
Agility	9.99	.60	50.00

The above table reveals that mean \pm Standard Deviation of the respective values of the selected test i.e. Abdomen strength test (56.20 ± 8.88), Shoulder strength test (19.46 ± 4.15), Grip strength test (44.09 ± 6.69), Leg strength test (168.34 ± 16.15), Strength endurance test (34.62 ± 3.91), Reaction ability test (8.23 ± 0.60), Agility test (9.99 ± 0.60).

Table 2: KMO and bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.623
Bartlett's Test of Sphericity	Approx. Chi-Square	646.769
	Df	325
	Sig.	.000

Table 2 reveals the Kaiser- Meyer- Olk in (KMO) and Bartlett's test. The KMO test measures the sampling adequacy. The sample size is considered to be sufficient if the value of KMO is greater than 0.05. In the present study the value of KMO is .623, which is greater than 0.05, hence from the above table, it may be concluded that the sample was

sufficient for applying the factor analysis. Further, Bartlett’s test of sphericity was used to test as to whether the correlation matrix is an Identity matrix or not. From the same table, we can see that the Bartlett’s test of sphericity is significant. That

is, its associated probability is less than 0.05. In fact, it is actually 0.000. This means that the correlation matrix is not an identity matrix.

Table 3: Component matrix^a unrotated factor solution

	Component							
	1	2	3	4	5	6	7	8
Abdomen strength	.198	-.181	-.520	-.496	.170	.201	.193	-.127
Shoulder strength	-.116	-.040	-.350	.025	.675	.372	-.266	.299
Grip strength	.417	.503	-.174	.475	-.036	-.163	-.173	-.141
Leg strength	-.138	.562	-.211	.618	-.046	.153	-.107	-.057
Strength endurance	.072	.421	-.501	.134	.040	.148	.303	-.183
Reaction ability	.317	-.055	.519	.139	-.117	.457	-.252	.068
Agility	-.096	.084	.596	-.228	-.006	.054	-.392	-.362

Extraction method: principal component analysis.

The table 3 shows the unrotated factor solution. Only three factors were retained in this analysis. The factor loading of the entire variable on each of eight factors have been shown here. Since, this is an unrotated factor solution, some of the variables may show their contribution in more than one factor

or in other words some of the test items are overlapping on each other. In order to avoid this situation, the factors are rotated. Varimax rotation has been used in this to rotate the factors as this is the most popular method used by the researcher due to its efficiency.

Table 4: Rotated component matrix varimax rotated solution (Final factor) rotated component matrix

	Component							
	1	2	3	4	5	6	7	8
Abdomen strength	.162	-.018	-.636	.424	-.165	.189	-.184	-.056
Shoulder strength	-.081	.006	-.053	.121	.025	.054	-.926	-.085
Grip strength	.469	.097	.620	.177	-.076	.094	.062	-.313
Leg strength	.030	-.248	.780	.260	.029	.192	-.124	-.101
Strength endurance	.226	-.216	.172	.654	.034	.196	-.036	-.063
Reaction ability	.203	.135	.145	-.584	.115	.426	-.059	.250
Agility	.050	-.317	-.086	-.681	.202	.091	.153	-.254

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 9 iterations.

The final solution of the factor analysis after the varimax rotation has been shown in this table 6. Clear picture emerges in this final solution about the variables explaining the factors correctly. Thus, the factors have non-overlapping variables in this final solution. If the variables have factor loading more than 0.6, it indicates that the factor extracts sufficient variance from the variables. Thus, all those variables having loading more than 0.6 or more on a particular factor is identified in that factor. Owing to this criterion, the following variables have been grouped in each of the eight factors.

Table 5: Factor 3 rotated factor loadings (Varimax rotation)

Abdominal strength	0.636
Grip strength	0.620
Leg strength	0.780
Vital capacity	0.737

Table 5 depicts that Abdominal strength test item contains the factor loading (0.636) which indicates that much of variability is explained by this test item in this factor, Grip strength test item contains highest factor loading (0.620) which indicates that much of variability is explained by this test item in this factor, Leg strength test item contains the factor loading (0.780) which indicates that much of variability is explained by this test item in this factor, Vital capacity test item contains the factor loading (0.737) which indicates that much of variability is explained by this test item in this factor.

Table 6: Factor 4 rotated factor loadings (Varimax rotation)

Strength endurance	0.654
Agility	0.681

Table 6 shows that Strength endurance test item depicts the factor loading (0.654) which indicates that much of variability is explained by this test item in the fourth factor whereas the Agility test explained 0.681 of the variability, which is highest in comparison to other test items in this factor.

Table 7: Factor 7 rotated factor loadings (Varimax rotation)

Shoulder strength	0.926
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Table 7 reveals that, in this factor, Shoulder strength test item was identified as the highest factor loading 0.926 which indicates that much of variability is explained by this test item in a particular factor and only a single item was identified which have the factor loading more than 0.6.

Table 8: Model for national level judokas

Factor Measured	Test Items	Factor Loading
Factor one	Abdominal strength	0.636
	Grip strength	0.620
	Leg strength	0.780
Factor two	Strength endurance	0.654
	Agility	0.681
Factor three	Shoulder strength	0.926

The above table depicts that, a variables determinant of national level judo players (male) and physical education

universities and physical education institutes judo players (male) check the strength of this test items (variables). Three factors were retained from all the seven test items. The variables (test items) having higher loading was identified from each of the retained factors for construction of test.

Discussion of findings

An attempt was taken to establish the physical, variables as determinant of National level judokas. The objectives of the study was fulfilled by applying the different statistical techniques as the issue variables has been deliberated by means of using factor analysis technique.

The authenticity of the results of research depends on a no. of factors, instances, selection of variables, selection of subjects etc. In the process of conducting a research authenticity of the instruments or tests used is a determining factor in credibility of results.

During the period of data collection the subjects reported to the area frequently at regular intervals. All the data collection took place in the morning between 6.00am to 09.30am. All the testers involved in testing were well acquainted with all the testing procedure. All the testers were well trained for conducting various test items before the data collection.

The data was analyzed in following section, in the first sections the assumption for applying the factor analysis were checked i.e. Kaiser- Meyer- Olkin (KMO) test of sample size was applied. It tests the adequacy of sample size. Further, Bartlett's test of sphericity was used to test as to whether the correlation matrix is an identity matrix or not.

As the no. of test items for measuring the different variables were multiple. Factor analysis was employed for assessing group's characteristics. By applying the factor analysis different test items with similar characteristic were grouped together. The most contributing test items in particular factor was revealed by applying factor analysis based on its efficiency in explaining a particular variable.

The reduced number of factor was used for related the variables to the identifying. Principle component analysis and Varimax rotation were used in analysis for identifying the factors. In unrotated factor solution usually some of the variable overlap in different factors. In order to do away with, final factor solution is obtained by using Varimax rotation. This enhances the incredibility of factors. It facilitated the researcher to identify each variable in one and one factor.

Factor one derived after factor analysis, Leg Strength test item depicts highest factor loading (0.780) which indicates that much of variability is explained by this test items in the second factor in comparison to all other test items. In this test, the subjects were requested to stand erect on the base of leg dynamometer, feet placing parallel about six inches apart. The subject hold the bar with both hands together at the centre, both palm towards the body, so that it rests at the junction of the thighs and trunk. The fastening belt was placed as low as possible over the hips and gluteus muscles. The knees slightly bent. From this position he pulled the bar of the dynamometer up, expending the knees.

Factor second, Agility test item contains highest factor loading (0.681) which indicates that much of variability is explained by this test items in a particular factor, in this test the subject asked to stand at starting line and to take start at signals/clap. The subjects were asked to complete the 40 meter distance (10x4) shuttle run in minimum time as much as they can. The scholar recorded the time with the help of stop watch from starting to finish.

Factor three, Shoulder Strength confidence test item was

identified as the highest factor loading (0.926) which indicates that much of variability is explained by this test items in a particular factor and in this test a Shoulder strength was obtained by administering the pull-up test on a horizontal bar of three centimetres diameter fixed at a convenient height, so that the subject's feet did not touch the floor while he was hanging with the arms straight. From this hanging position he pulled himself up until the chin was above the bar and instructed to avoid kicking and jerking movements. Total numbers of correctly executed pull – ups were considered as the scores for shoulder strength.

Summary

The main purpose of this study was to determine some of the physical, variables as determinants of judokas at national level. To determine the performance of national level Judokas on the basis of Physical variables. With keeping the objectives in the mind, Physical variables were studied and conclude that, can these factors be used to determine the performance level of the national level judo player.

The mean and standard deviation of all the variables were found for the selected test i.e. Abdomen strength test (56.20 ± 8.88), Shoulder strength test (19.46 ± 4.15), Grip strength test (44.09 ± 6.69), Leg strength test (168.34 ± 16.15), Strength endurance test (34.62 ± 3.91), Reaction ability test (8.23 ± 0.60), Agility test (9.99 ± 0.60)

In the case of abdominal strength the factor loading (0.636) which indicates that much of variability is explained by this test item in this factor, grip strength test item contains highest factor loading (0.620) which indicates that much of variability is explained by this test item in this factor, leg strength test item contains the factor loading(0.780) which indicates that much of variability is explained by this test item in this factor, vital capacity test item contains the factor loading(0.737) which indicates that much of variability is explained by this test item in this factor.

Shoulder strength test item was identified as the highest factor loading 0.926 which Indicates that much of variability is explained by this test items in a particular factor and only a single item was identified which have the factor loading more than 0.6.

Conclusion

From the above findings, we can find that a test items determinant of national level judo players (male) and physical education universities and physical education institutes judo players (male) check the strength of this test items (variables). Three factors were retained from all the fourteen test items. The variables (test items) having higher loading was identified from each of the retained factors for construction of test.

The authenticity of the results of research depends on a no. of factors, instances, selection of variables, selection of subjects etc. In the process of conducting a research authenticity of the instruments or tests used is a determining factor in credibility of results.

After applying factor analysis the test items contributing most in particular factors were selected and eight factors were derived with their highest factor loading of the test items in each factor. Thus, the factor together explained 72.77% of the total variance of the model.

Factor thirds, Shoulder Strength confidence test item was identified as the highest factor loading (0.926) which indicates that much of variability is explained by this test items in a particular factor and in this test a Shoulder strength

was obtained by administering the pull-up test on a horizontal bar of three centimetres diameter fixed at a convenient height, so that the subject's feet did not touch the floor while he was hanging with the arms straight. From this hanging position he pulled himself up until the chin was above the bar and instructed to avoid kicking and jerking movements.

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