



## Design a Testing Battery to Measure the Performance of Some Basic Skills in Boxing for Students at the Faculty of Physical Education

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### Abstract

*This research aims to extract testing battery to measure the performance of some basic skills in boxing for students at the Faculty of Physical Education. The researcher identified all basic skills that involved in the course description of Boxing (1) for Second year, Faculty of Physical Education in Port-Said. And through reference survey he designed eight tests to measure these basic skills and proceed all scientific coefficients, Content validity, Stability, Intrinsic Validity and discriminatory ability which reached the required rate for conduct the factor analysis. One hundred students in second year in faculty of physical education in Port-Said responded to the proposed eight tests in the period from 16-17/ 3/2016. The researcher used (SPSS) software for conducting statistical treatments. In light of the factor analysis using components Principal method and after orthogonal rotation, extracted five factors represent five domains cover the basic skills as follows: (Lead hand Straight punch(Jab), Rear hand Straight punch (Cross), The speed of one combination punch, The speed of Jab-cross combination punches, Stance & foot work). Consequently, established a testing battery to measure the performance of some basic skills in boxing, which included all proposed skill tests were characterized by high factor validity because of their high loading values in a factor which measures a particular domain.*

**Keywords:** Factor analysis, Mega-Strike, COUNT-N-TIME

### Introduction

The world's attention has increased in recent years for objective tests and effective measurement instruments in the evaluation process because its effective to reach the higher levels of any game or sporting event.

The boxing sport is an important part of Olympic games. Therefore, all organizers of boxing's affairs seek to develop its laws and management based on electronic devices, modern tools, tests and measurement instruments to reach the higher levels in boxing and support scientific planning.

In addition, Boxing sport is one of most important sporting activities in Egypt that assumes full care so it was a part of the courses in various faculties of Physical Education for Boys, military and sports schools. Therefore, the selection students process and evaluation process need to take into account developing their tests and standards.

### Research problem

Through the researcher taught Boxing course at the Faculty of Physical Education in Port Said found that the process of assessing students' skills level based on self-

evaluation during the lecture or summative test, which may lack objectivity in some cases, so there is a persistent need to build a battery of objective tests pose equal opportunities for all students to evaluate their performance.

In addition, Through readings of many sources, references and studies related to measuring the skill level in boxing, the researcher found a battery skill test designed by (Ismail et al., 2000), which It has been relied upon in many researches and studies, which help him in designing the current battery as a litmus indicative.

And with developing many technological innovations of instruments in the field of measurement and evaluation of sports in general and boxing in particular. For Examples of such technological devices in boxing Mega-Strike device. The researcher was calibrate this device by using Biomechanics analysis to measure the force of the punch (Rakha, 2013), this device is also used to measure the speed of response. As well as device COUNT-N-TIME to measure the speed of punches, and the speed of combination punches.

Through the foregoing, this research is a serious scientific attempt to recruit potential offered by the technological

innovations to design a modern technology battery consists of objective tests to measure the skill level in boxing for students at the Faculty of Physical Education.

### The research aims

1- Design some skill tests to measure skill level in boxing for students at the Faculty of Physical Education.

2- Extraction testing battery to measure skill level in boxing for students at the Faculty of Physical Education.

### Research question

1- Is the intercorrelation matrix between the proposed skill tests to measure the skill level in boxing for students of the Faculty of Physical Education "factorable"?

2- What is the extraction testing battery from factorial analysis to measure skill level in boxing for students at the Faculty of Physical Education?

### The terminology

#### 1- Testing Battery

(Hassanein, 1987) defined testing battery as "a group of several tests are applied respectively by the individual to achieve a desired objective".

### 2- Factor analysis

(DeCoster, 1998) defined Factor analysis as a collection of methods used to examine how the underlying constructs influence the responses of a number of measured variables. There are basically two types of factor analysis: exploratory and confirmatory. Exploratory factor analysis (EFA) attempts to discover the nature of the constructs influencing a set of responses. Confirmatory factor analysis (CFA) tests whether a specified set of constructs is influencing responses in a predicted way.

### Method

The researcher used the descriptive method, as this is more suitable for the nature of the research.

### Sample Research

#### Sample Size

The researcher selected a sample purposefully from students in second year at Faculty of Physical Education in Port Said for the academic year 2015/2016 AD where already studied the course (Boxing-1for Boys). And from this sample selected randomly (100 students).

#### The homogeneity of the sample:

Table (1)

Minimum, Maximum value, Means & SD of Skewness for weight, height, age & IQ (n=100)

	Measurement unit	Minimum	Maximum	Means	SD	Skewness		
						Value	Standard error	
1	Height	Cm	160.00	190.00	175.58	6.79	-.180-	.241
2	Weight	Kg	53.00	103.00	73.62	10.85	.636	.241
3	Age	Year/day	20.15	23.201	21.029	.80	.770	.241
4	IQ	Degree	3.00	90.00	28.68	18.19	1.332	.241

From (Table 1) it is clear that skews values ranged between  $(\pm 3)$  reflecting the sample homogeneity on the variables of weight, height, age, and IQ.

Table (2)

The sample representation Percentages of elite men and youth boy boxers weight categories

	Weight Kg	Represent Weight Categories	Represent in sample %	
1	Light Weights	To 60 Kg	Light Fly, Fly, Bantam & Light	16 %
2	Middle Weights	To 75 Kg	Light Welter, Welter & Middle	51%
3	Heavy Weights	Over 75 Kg	Light Heavy, Heavy & Super Heavy	33%

From (Table 2) it is clear that sample represented all elite men and youth Boy boxers weight categories as the normal distribution. 16 % of the sample represented light Weights (Light Fly, Fly, Bantam & Light), 51% of the sample represented middle Weights (Light Welter, Welter & Middle), and 33% of the sample represented heavy Weights (Light Heavy, Heavy & Super Heavy). (AIBA, 2015)

**The Devices and tools used in research**

- 1- A restameter device to measure the height to nearest ½ cm.
- 2- An electronic scale device to measure weight to nearest ½ kg.
- 3- A high intelligence test designed by (Khairy, ND).
- 4- Mega-Strike device: (Rakha, 2013) calibrated Mega-Strike device to measure punching force in boxing through the following:

Momentum (Mr) = (0.780×Megastrike value) +17.90

$$F = \frac{M_{\text{By Regression predictive formula}}}{\text{Time from (mega-strike)}}$$

Figure (1)  
Mega-Strike device



COUNT-N-TIME device

This device is used for the following:

- Counts the number of good strikes in a time period (up to 90 seconds)
- Times a preset number of strikes (up to 990) to nearest 1/10th of a second (up to 99.9 seconds)
- Times a preset combination (up to 9 strikes) to nearest 1/100th of a second

Figure (2)  
COUNT-N-TIME device



Identify the basic skills in Boxing under research

The researcher identified all basic skills that involved in the course description of Boxing (1) for Second year, Faculty of Physical Education in Port Said, as follows:

- 1- Stance & foot work
- 2- Lead hand straight punch to the head and body (Jab).
- 3- Backhand straight punch to the head and body (Cross)
- 4- Combination straight punch (Lead – Backhand, and Backhand- lead)

Determine the appropriate tests to measure basic skills under research

For the purpose of obtaining the appropriate tests of basic skills in Boxing, the researcher has the following:

- 1- Comprehensive survey of many references and scientific research like, (Sonnenberg, 1996), (Fiedler, 1997), (Frank & Peter, 1998), (Doug, 1999), (Danna, 2000), (Ismail et al., 2000), (Siegfried & Ellwanger, 2008), (Rakha, 2009), (Rakha, 2013), (Lissenden, 2013).
- 2- Using battery skill tests in boxing, designed by (Ismail et al. 2000) as litmus indicator.
- 3- Using certain electronic devices (Mega-Strike - COUNT-N-TIME).

The Reasearcher reached in a number of appropriate tests of basic skills in Boxing. Table 3 shows those tests.

Table (3)  
The appropriate tests to measure basic skills under research

No	Skills	Test	Unit	Test Description	Image
1	Stance & foot work	Stance & foot work evaluation	Degree	<p>Instruments: Performance Evaluation Card Performance specifications: The Boxer performing the stands ready and footwork, the evaluator assesses the performance of Stance &amp; foot work according to the criteria listed in the evaluation card, They are as follows: The position of the (head - arms and fist - Rotation of the trunk to the right with a slight bends forward - Bend the knees with the distribution of the weight of the body on the feet - Stand on the rear instep - Maintaining the side distance - Maintaining distance between the front and rear foot - Move on harrows - move foot crawls - Optimum speed and appropriate performance) Register: The Evaluator registers the boxer's degree from Ten degrees so that takes all the standard one degree.</p>	
2	Lead hand straight punch to the head (Jab)	Force Test by Mega-Strike Device Speed of response Test by Mega-Strike Device	Newton Second	<p>Instruments: Mega-Strike Device Performance specifications: Boxer stands and get ready in the long distance from the Mega Strike device, and when he hears the beep of device he should perform the specified punch in the star drawn in the middle of the device. Register: For Force Degree: The evaluator registers the degree of the mega strike device and then convert it to the quantitative amount by using the following formula: <math display="block">Mr = (0.780 \times \text{MegaStrike value}) + 17.90</math> <math display="block">F = \frac{M \text{ By Regression predictive formula}}{\text{Time from (mega-strike)}} \text{ . (Rakha, 2013)}</math></p>	
3	Lead hand straight punch to the body (Jab)	Force Test by Mega-Strike Device Speed of response Test by Mega-Strike Device	Newton Second	<p>For Force Degree: The evaluator registers the degree of the mega strike device and then convert it to the quantitative amount by using the following formula: <math display="block">Mr = (0.780 \times \text{MegaStrike value}) + 17.90</math> <math display="block">F = \frac{M \text{ By Regression predictive formula}}{\text{Time from (mega-strike)}} \text{ . (Rakha, 2013)}</math></p>	
4	Rearhand straight punch to the head (Cross)	Force Test by Mega-Strike Device Speed of response Test by Mega-Strike Device	Newton Second	<p>For speed response The evaluator registers the speed response (the time from the beep of the device to the arrival of specified punch in 1 / 100th of a second).</p>	
5	Rearhand straight punch to the body (Cross)	Force Test by Mega-Strike Device Speed of response Test by Mega-Strike Device	Newton Second	<p>For speed response The evaluator registers the speed response (the time from the beep of the device to the arrival of specified punch in 1 / 100th of a second).</p>	
6	Combination straight punch	- The speed of Jab-Cross combination punches in the 30th test	Count	<p>- Instruments: COUNT-N-TIME - Performance specifications: Boxer stands and get ready in the long distance from the coach who wears COUNT-N-TIME device, When the coach gives the signal to start The Boxer should perform the specified Combination straight punch Register: I- For the speed of Jab-Cross combination punches in the 30th test: The Evaluator registers the count of punches that the boxer had performed in 30 second. II- The speed of one (Jab-Cross) or (Jab-Cross-Jab) combination punch test: The Evaluator registers the time from the device in 1/100th of a second.</p>	
7		- The speed of one Jab-Cross combination punch test	1/100th of a second		
8		- The speed of one Jab-Cross-Jab combination punch test	1/100th of a second		

**The content validity of proposed skill tests:**

(Bahi, 1999) refers that the content validity is a measure the appropriateness of the test's aspects of the measured components through logically analyzed its elements. To achieve this, the researcher designed a questionnaire about the eight proposed skill tests and presented it to Five experts hold a PhD degree in Boxing. They have to propose some amendments to the skill tests and agreed 100% on its ability to measure the skill level and they are suitable conducting a factorial analysis of them, which shows the high content validity of the tests.

**The stability and Intrinsic Validity of the proposed skill tests:**

To ensure the stability of the proposed tests, the researcher used test – retest method (Bahi, 1999), and conducted the measurements on (20) students from a random sample of the second year students who have studied boxing course (1) in the first semester of the academic year 2015/2016 and outside the core sample. The first measurement was conducted on 9/3/2016 and the second dated 03/15/2016. The researcher adopted (0.75) correlation coefficient and above. The researcher also obtained the intrinsic validity of the tests through the square root of stability factor (Bahi, 1999). In addition, the researcher benefited from this exploratory implementation in explained the tests to assistant team, identified the obstacles that may accompany the implementation, and identified the time it takes to perform.

Table (4)  
The stability and Intrinsic Validity of the proposed skill tests

No	Basic Skills Tests	Unit	First Test		Second Test		R	P value	Intrinsic Validity
			Means	SD	Means	SD			
1	Stance & foot work evaluation (S&FW)	Degree	5.70	1.62	5.65	1.66	0.894	0.00	0.945
2a	Lead hand straight punch to the head (Jab) force Test (LHSPH_F_test)	Newton	61.05	11.33	57.83	10.97	0.949	0.00	0.974
2b	Lead hand straight punch to the head (Jab) speed of response Test (LHSPH_RS_test)	Second	0.63	0.12	0.59	0.11	0.935	0.00	0.967
3a	Rear hand straight punch to the head (Cross) force Test (RHSPH_F_test)	Newton	70.52	13.47	64-80	12.72	0.928	0.00	0.963
3b	Rear hand straight punch to the head (Cross) speed of response Test (RHSPH_RS_test)	Second	0.66	0.10	0.65	0.10	0.887	0.00	0.941
4a	Lead hand straight punch to the body (Jab) force Test (LHSPB_F_test)	Newton	62.60	14.43	61.07	12.30	0.924	0.00	0.961
4b	Lead hand straight punch to the body (Jab) speed of response Test (LHSPB_RS_test)	Second	0.58	0.12	0.54	0.10	0.905	0.00	0.951
5a	Rear hand straight punch to the body (Cross) force Test (RHSPB_F_test)	Newton	73.78	13.73	73.43	12.57	0.923	0.00	0.961
5b	Rear hand straight punch to the body (Cross) speed of response Test (RHSPB_RS_test)	Second	0.59	0.06	0.57	0.08	0.902	0.00	0.950
6	The speed of Jab-cross combination punches in the 30th test (JCCPs_S_30thtest)	Counting	54.60	13.44	55.10	12.37	0.929	0.00	0.964
7	The speed of one Jab-cross combination punch test (One JCCPs_S_test)	1/100th of a second	0.188	0.05	0.186	0.06	0.957	0.00	0.978
8	The speed of one Jab-Cross-jab combination punch test (One JCJPs_S_test)	1/100th of a second	0.171	0.04	0.164	0.03	0.938	0.00	0.968

Table (4) shows that the correlation coefficient between the first measuring and the second ranged between (0.887 - 0.957) level of significance (0.00), which is significant at the level (0.05), indicating a high stability Coefficient. In addition, the Intrinsic Validity ranged between (0.945 - 0.978) that also indicates a high Intrinsic Validity.

#### The Basic implementation of the proposed skill tests:

After confirming the scientific Coefficients and suitability for the research sample, the researcher conducting the

basic implementation of the proposed skill tests over the two days 16-17 / 3/2016, where divided the research sample (100 Students) into two equal halves. Fifty students responded to the proposed skills tests per day, The aim of this implementation to verify the discriminatory ability of the tests as well as conduct the factor analysis.

#### The discriminatory ability of the tests

Table (5)  
Mean, standard deviation and T-test for the two groups in high level and low level (N=100)

No	Basic Skills Tests	Unit	High Level group		Low Level group		T-test for Equality of Means	P value
			Means	SD	Means	SD		
1	S&FW	Degree	8.04	0.20	3.96	0.20	72.12	0.00
2a	LHSPH_F_test	Newton	71.22	6.77	39.32	6.95	16.43	0.00
2b	LHSPH_RS_test	Second	0.53	0.50	1.01	0.16	-13.87	0.00
3a	RHSPH_F_test	Newton	86.27	5.93	46.83	10.62	16.21	0.00
3b	RHSPH_RS_test	Second	0.54	0.03	1.03	0.39	-6.18	0.00
4a	LHSPB_F_test	Newton	87.49	19.30	41.85	7.55	11.01	0.00
4b	LHSPB_RS_test	Second	0.46	0.06	0.89	0.20	-10.16	0.00
5a	RHSPB_F_test	Newton	93.34	15.39	49.66	8.30	12.49	0.00
5b	RHSPB_RS_test	Second	0.53	0.04	0.86	0.12	-12.23	0.00
6	JCCPs_S_30thtest	Counting	79.68	6.90	40.92	1.55	27.39	0.00
7	One JCCPs_S_test	1/100th of a second	0.14	0.02	0.28	0.03	-16.15	0.00
8	One JCJCPs_S_test	1/100th of a second	0.15	0.02	0.31	0.05	-14.55	0.00

Table (5) cleared that t-test values ranged (-16.15, 72.12) with significance level (0.00), this mean that there is a statistically significant difference in the proposed skill tests between the high and low level group at a significant level (0.05). This result indicates that tests can distinction between high-level and low level .(Allawy & Radwan, 1988).

#### Statistical treatment

The researcher used (SPSS.V20) software for conducting following statistical treatments: (Mean, SD, Skewness,

correlation coefficient, Intrinsic Validity, T-test, KMO, Bartlett's Test, Factor analysis).

#### Results

Present the results of the first question "Is the intercorrelation matrix between the proposed skill tests to measure the skill level in boxing for the students of the Faculty of Physical Education "factorable"?"

Table (6)  
The correlation matrix of proposed skills tests in boxing tests

	1-S&FW	2a-LHSPH_F_test	2b-LHSPH_RS_test	3a-RHSPH_F_test	3b-RHSPH_RS_test	4a-LHSPB_F_test	4b-LHSPB_RS_test	5a-RHSPB_F_test	5b-RHSPB_RS_test	6-JCCPs_S_30thtest	7- One JCCPs_S_test	8- One JCJCPs_S_test
1-S&FW		-.030-	-.019-	.190	-.164-	.057	-.206-*	-.014-	-.039-	-.113-	-.042-	.009
2a-LHSPH_F_test			-.863-**	.274**	-.251-*	.506**	-.623-**	.336**	-.506-**	-.127-	-.280-**	-.020-
2b-LHSPH_RS_test				-.248-*	.336**	-.407-**	.668**	-.267-**	.556**	.213*	.375**	.164
3a-RHSPH_F_test					-.781-**	.306**	-.396-**	.596**	-.615-**	-.047-	-.382-**	-.036-
3b-RHSPH_RS_test						-.011-	.274**	-.267-**	.513**	.217*	.333**	.143
4a-LHSPB_F_test							-.796-**	.404**	-.385-**	.115	-.302-**	-.082-
4b-LHSPB_RS_test								-.311-**	.463**	-.019-	.216*	.076
5a-RHSPB_F_test									-.732-**	.216*	-.467-**	.081
5b-RHSPB_RS_test										.066	.617**	.151
6-JCCPs_S_30thtest											.041	.246*
7- One JCCPs_S_test												.578**
8- One JCJCPs_S_test												
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.											.615	
Bartlett's Test of Sphericity									Approx. Chi-Square		829.460	
									df		66	
									Sig.		.000	

\* Correlation is significant at the 0.05 level (2-tailed).\*\* Significant at the 0.01 level (2-tailed)

Table (6) shows the correlation matrix of (12) tests to measure basic skills in boxing, and notes from the table that the matrix contains (66) correlation coefficients (not counted the diameter cells), including:

- (32) positive correlation Coefficients representatives (48.48%), Four coefficients of them significant at (0.05)

level, (16) Coefficient significant at (0.01) level, and (12) correlation coefficients were not significant.

- (34) negative correlation Coefficients representatives (51.51%), Three coefficients of them significant at (0.05) level, (16) Coefficients significant at (0.01) level, and (13) correlation coefficients were not significant.

In addition, Table (6) shows that the value of Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy reached (0.615) is greater than (0.50) which indicates that sample size (100 students) is suitable to conduct Factor Analysis. As for Bartlett's Test of Sphericity the level of significance reached (0.00) is smaller than (0.05) which indicates that the correlation between the variables are statistically significant, which indicates the validity of data for factor analysis. (Friel, 2010)

Present the results of the second question "What is the extraction testing battery from factorial analysis to measure skill level in boxing for students at the Faculty of Physical Education?"

Table (7)  
Mean, SD, Skewness and the Factor analysis of correlation matrix before rotation (initial solution)

No	Tests	Descriptive Statistics			Communality	Component				
		Mean	SD	Skewness		1	2	3	4	5
1	S&FW	5.70	1.65	.287	.842	-.132-	-.161-	-.003-	.574	.685
2a	LHSPH_F_test	56.65	12.82	-.286-	.866	-.734-	.391	-.290-	.088	-.287-
2b	LHSPH_RS_test	.72	.20	1.289	.878	.757	-.248-	.419	-.084-	.245
3a	RHSPH_F_test	66.02	15.66	-.283-	.866	-.709-	-.367-	.407	.252	-.008-
3b	RHSPH_RS_test	.74	.27	1.351	.829	.587	.549	-.118-	-.368-	.182
4a	LHSPB_F_test	62.55	19.73	1.258	.816	-.642-	.514	-.010-	-.118-	.354
4b	LHSPB_RS_test	.66	.20	1.592	.877	.751	-.444-	.135	-.188-	-.249-
5a	RHSPB_F_test	69.54	18.50	1.007	.816	-.668-	-.007-	.559	-.229-	-.069-
5b	RHSPB_RS_test	.67	.14	1.320	.818	.850	.167	-.178-	.124	.141
6	JCCPs_S_30thtest	58.56	15.37	.425	.722	.094	.382	.634	-.350-	.206
7	One JCCPs_S_test	.20	.05	.413	.893	.229	.458	.549	.482	-.312-
8	One JCJCPs_S_test	.22	.07	.909	.865	.638	.389	.093	.514	-.184-
		Total				4.59	1.67	1.51	1.28	1.03
Initial Eigenvalues (Extraction Sums of Squared Loadings)		% of Variance				38.26	13.95	12.69	10.66	8.59
		Cumulative %				38.26	52.20	64.82	75.48	84.07

Extraction Method: Principal Component Analysis.

a. 5 components extracted.

Table (7) shows that all the means larger than standard deviations for each test separately, as well as that all Skewness values ranging from ( $\pm 3$ ) which refers to normalization of sample research results in proposed skills tests.

According to the Kaiser criterion, It was extracted five factors which they Initial Eigenvalues more than (1.0) explain (84.07%) of Cumulative Variance. As well as noted from the table (6) that the extracted factors in descending order according to their importance as follow: The first factor (38.26%), the second factor (13.95%), the

A) Determined the number of Extracted factors from factorial analysis of skill tests before rotation (Initial Solution) by using components Principal method:

The researcher used the principal components analysis (PCA). PCA is a multivariate technique in which a number of related variables are transformed to set of uncorrelated variables (Jackson, 1991). As well as PCA accepts the Kaiser criterion to determine the extracted factors. The Kaiser rule is to drop all components with eigenvalues under 1.0 (Brown, 2015).

third factor (12.69%), the fourth factor (10.66%) and fifth factor (8.59%).

B) The interpretation of extracting factors after Orthogonal Rotation by Varimax method (final Solution):

In order to get the simple structure for Thurston 1947 to refer to the most readily interpretable solutions, in which each factor is defined by a subset of indicators that load highly on the factor; and each indicator has a high loading on one factor. The researcher used the Orthogonal Rotation by Varimax technique, which constrained the factors are uncorrelated (Brown, 2015).



Table (8)  
Component matrix proposed skills tests after rotating.

No	Tests	Component				
		1	2	3	4	5
1	S&FW					.907
2a	LHSPH_F_test	-.869-				
2b	LHSPH_RS_test	.840				
3a	RHSPH_F_test		-.892-			
3b	RHSPH_RS_test		.814			
4a	LHSPB_F_test	-.756-				
4b	LHSPB_RS_test	.860				
5a	RHSPB_F_test		-.699-			
5b	RHSPB_RS_test		.737			
6	JCCPs_S_30thtest				.830	
7	One JCCPs_S_test			.791		
8	One JCJCPs_S_test			.917		
Total		3.091	2.829	1.616	1.427	1.126
Rotation Sums of Squared Loadings	% of Variance	25.761	23.578	13.465	11.890	9.380
	Cumulative %	25.761	49.339	62.805	74.694	84.07

Extraction Method: Principal Component Analysis.  
Rotation Method: Varimax with Kaiser Normalization.

Noted from table (8) that loading values of factors may have changed when compared to the values before rotation as well as the Initial Eigenvalues. While the cumulative variance value is maintained in (84.07%) and the extracted factors were arising in descending in order of importance. The researcher has retained a test with high loading which is above ( $\pm 0.50$ ) for each factor. To stand out even skill tests with high loading in the five factors and thus can be interpreted.

i- The interpretation of the First Factor

Through a table (8) it is clear that the first factor includes four skill tests represent (25.76%) of the Cumulative variation, a (Lead hand straight punch to the head force Test, Lead hand straight punch to the head speed of response Test, Lead hand straight punch to the body force Test, and Lead hand straight punch to the body speed of response Test). Loading values of those tests on this factor amounted (-0.869-, 0.840, -0.756-, 0.860) respectively. Therefore, the researcher named the first factor (Lead hand Straight punch-Jab) because it included all types of Lead hand Straight punch which achieved a high loading value.

ii- The interpretation of the Second Factor

Through a table (8) it is clear that the second factor includes four skill tests represent (23.58%) of the Cumulative variation, a (Rear hand straight punch to the head force Test, Rear hand straight punch to the head speed of response Test, Rear hand straight punch to the body force Test, Rear hand straight punch to the body speed of response Test) and loading values of those tests on this factor amounted (-0.892-, 0.814, -0.699-, 0.737) respectively. Therefore, the researcher named the second factor (Rear hand Straight punch-Cross) because it included all types of Rear hand Straight punch which achieved a high loading value.

iii- The interpretation of the Third Factor

Through a table (8) it is clear that the third factor includes two skill tests represent (13.46%) of the Cumulative variation, a (The speed of one Jab-cross combination punch test, The speed of one Jab-Cross-jab combination punch test) and loading values of those tests on this factor amounted (0.791 , 0.917) respectively. Therefore, the researcher named the third factor (The speed of one combination punch) because it included the speed of one combination punch tests.

iv- The interpretation of the Fourth Factor

Through a table (8) it is clear that the fourth factor includes one skill test represent (11.89%) of the Cumulative variation, The speed of Jab-cross combination punches in the 30th test and loading value amounted (0.830). Therefore, the researcher named the fourth factor (The speed of Jab-cross combination).

v- The interpretation of the Fifth Factor

Through a table (8) it is clear that the fifth factor includes one skill test represent (9.38%) of the Cumulative variation, The Stance & foot work evaluation test and loading value amounted (0.907). Therefore, the researcher named the fifth factor (The Stance & foot work evaluation).

### Conclusions

1- In light of the factor analysis using orthogonal rotation, showed five factors have been accepted represent five particular domains cover the basic skills assessed in the Second year, Faculty of Physical Education in Port Said students (course Boxing 1), As follows: (Lead hand Straight punch- Rear hand Straight punch - The speed of one combination punch- The speed of Jab-cross combination punches- Stance & foot work).

2- Established a testing battery to measure the skill level in boxing for students at the Faculty of Physical Education, which included all proposed skill tests in table (2) because of their high loading values in a factor which measures a particular domain.

### Recommendations

1- Applying the extracted testing battery to measure the skill level in boxing and setting up a standard score tables according to different local environments.

2- Build and develop many testing batteries that use modern technologies in boxing, which measure physical and skills so that help specialists in necessary evaluation processes.

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