



## A Factor Study of Some Physical Abilities and the Skills of Sending and Forehand Strike in Badminton for Students of the Faculties of Physical Education and Sport Sciences

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### ABSTRACT

Published online: 20/9/ 2025

**Keywords:**

*Factor study, Physical abilities and skills (serve, forehand), badminton*

Testing and measurement is one of the scientific means that helps in the process of selecting the best students for the requirements of the sport activity practiced according to their physical abilities and the level of their skill performance in badminton, and in order to proceed the selection process correctly, it is necessary to use tests and measurement because it is the best means by which to identify the physical and skill abilities of students, and the research aims to To- Determining the physical tests of badminton students in the form of namable and interpretable factors, and determining the tests of the sending and front stroke skills of badminton students in the form of namable and interpretable factors, and determining the simple factor structure of physical tests and the skills of sending and forehand for students of the faculties and departments of physical education and sports sciences in badminton, and the descriptive curriculum was used on (102) students in the faculties and departments of physical education and sports sciences of (Salah Al-Din -University). Erbil and Soran) in Erbil Governorate for the year 2024-2025 , and (11) physical tests and (4) skill tests were applied, and after processing the data, a set of conclusions were reached: - Seven orthogonal factors were extracted from the process of factor analysis of the results of the tests that the research sample underwent. - In light of the conditions for the acceptance of the factor, (4) factors were accepted and named as (the first factor with the transitional speed, the second factor with the forward dimensional strike, the third factor with the skill of transmission, and the fourth factor with the distinctive force The fifth and seventh factors were neglected because they measure a complex component that is difficult to name and interpret, - the results indicate that the sixth factor using the orthogonal rotation did not achieve the specified number of factor acceptance and was therefore neglected.

## 1 - Introduction and the importance of the research:

This development in the field of sports is a remarkable development through advanced sports results and levels as a result of proper and programmed planning, so it has become very necessary for researchers to develop tests that suit the requirements of each sporting event in order to be in line with the great and tremendous progress that countries have reached, and that testing and measurement are among the scientific means that help in the selection process. The modern trend in teaching, education, and skill performance training in badminton emphasizes the need to integrate physical abilities with basic skills, and in order to conduct the selection process correctly, it is necessary to use tests and measurement because it is one of the best means to identify the physical and skill abilities of students. Therefore, the importance of the research lies in studying some physical abilities and the skills of serving and forehand in badminton in an advanced statistical method called (factor analysis) in order to reach the best and purest tests that are available in order to reach the best and purest tests that are available to the students of the sports selection process in order to reach the best and purest tests that are available to the best and purest of the sports selection process in order to reach the best and purest tests that are available to the sports selection process in order to reach the highest levels of performance in order to achieve the best and purest tests that are available in the sport selection process in order to reach the highest levels of performance. Suitable for the selection of students with badminton.

### 1.2 Research Problem:

Badminton is one of the games that depends primarily on the players' mastery of individual skills and physical abilities, whether the player's performance is individual or even. In order to reach a set of final tests, they did not find any objective means through which to evaluate the physical abilities and skill performance level of the badminton student, so the researchers studied this problem and tried to reach a set of physical and skill tests that are suitable for selecting the students of the faculties and departments of physical education and sports sciences in badminton and benefiting from them in filling the shortage in the tools to measure the physical abilities of the target group in badminton.

### 1.3 Research Objectives:

- 1- Determining the physical tests of badminton students in the form of namable and interpretable factors.
- 2- Determining the tests of the sending and forehand skills of students in badminton in the form of naming and interpretable factors.
- 3- Determining the simple factor structure of physical tests and the skills of sending and front stroke for the students of the faculties and departments of physical education and sports sciences in badminton.

### 1.4 Research Areas:

**1.4.1 Human Field:** Students of the fourth stage in the faculties and departments of physical education and sports sciences of the universities of (Salah al-Din- Erbil and Soran) in Erbil Governorate for the year 2024-2025 .

**1-4-2 Temporal Domain:** 31/10/2024 until 1/7/2025.

**1.4.3 Spatial Field:** The inner hall of the faculties of the Departments of Physical Education and Sport Sciences.

## 3- Research methodology and field procedures:

### 3.1 Research Methodology:

The researchers used the descriptive method of studying the interrelationships (overlapping) for the appropriateness and nature of the research, as (Owais, 1999) indicates that "relational research is useful in knowing the interrelationships between variables to varying degrees and in realistic situations" (Owais, 1999, 16).

### 3.2 The research population and its sample:

The researchers selected the research population from the students of the fourth stage of the faculties and departments of education, physical education and sports sciences of the universities of (Salah al-Din- Erbil and Soran) in Erbil governorate for the academic year (2024-2025 ), which are (157) male and female students, and since the study is limited to students only, female students were excluded, and thus the number of sample members became (121) students, and after the injured, failing and absent students were excluded from the experiment The main group of (7) students, and (12) students were selected as a sample for the survey experiment, thus the work of (102) students (84.29%) of the total population was stable .

### 3.3 Means, Devices and Tools Used:

The researchers used (Arabic sources and references, personal interviews, testing and measurement, the International Information Network, an electronic stopwatch (Casio) (4), a personal computer (**Lenovo**) type, a handheld calculator (**Flamingo**) (2), various colored ropes, badge rackets (20), a legal natural flying vane (50), and a metric measuring tape (50 meters) (2) and colored adhesive tapes for the layout of the stadium).

### 3-4 Steps to Selecting Physical and Skill Tests :

Accredited international tests have been nominated because they have good scientific foundations represented by honesty, consistency and objectivity, which have already been applied to the Iraqi environment, which are (15) tests with (11) physical tests and (4) skill tests and the following:

**First: The force characterized by the speed of the arms:** bending and extending the arms from the inclined position (10 seconds). (Al-Janabi, 2019, 188), Leaning forward and bending the arms for (15) seconds. (Abdul-Hussein, 2013, 63)

**Second: The strength characterized by the speed of the two legs:** from the standing position to bend and extend the knees for 20 seconds (Abdul-Jabbar and Ahmed, 1984, 286), and partridge for a distance of (10 m) back and forth (Asad, 2011, 168).

**Third: Transitional Speed:** Running (10 m) from the high position (Al-Sumaida'i, 2020, 363), running (20 m) from the high start (Al-Beik, 2009, 108).

**Fourth: Motor Response Speed:** Nelson of the Selective Motor Response of the Legs (Barham, 1995, 572).

**Fifth: Prolonging strength:** sitting from lying down (30) seconds (Al-Sumaida'i, 2020, 265), bending and extending the arms from procrastinating (30) seconds (Ismail & Al-Azmi, 2011, 156).

**Sixth: Speed Length:** Running (120 m) from the high start position (Agha, 2012, 140), running (150 m) from the high start position (Jaber, 2011, 6).

**Seventh: Transmission Skill:** Accuracy of Distance Transmission (Abdul-Hussein, 2013, 63), Accuracy of Short Transmission (Abdul-Hussein, 2013, 64).

**Eighth: Forehand Strike Skill:** Forward Dimensional Strike (Abdul-Hussein, 2013, 67), Playing Strikes on the Net (Abdul-Hussein, 2013, 76).

### 3.5 Exploratory Experiment:

#### 3.5.1 The First Exploratory Experiment:

The researchers conducted an exploratory experiment on Sunday, 17/11/2024 on (12) students from the Faculty of Physical Education at Salaheddin University – Erbil for the academic year 2024-2025 and they were excluded from the main work sample, as the exploratory experiment is "practical training for the researcher to identify for himself the negatives and positives that he encounters during the test to avoid them when implementing the main experiment" (Al-Mandalawi, et al., 1989, 107) The aim of this experiment is to ensure the suitability of the tests for the research variables, the validity of the devices and tools used in the tests, the level of the sample members, the efficiency of the assistant team, as well as the sequence of the application of the tests and their distribution according to their difficulty over three days, as follows:

**First day:** (Running (10m) from the high position, running (20m) from the high start, bending and extending the arms from procrastinating (30) seconds, distance transmission accuracy, short transmission accuracy).

**The second day:** ( Forward support (bending and extending the arms for 15 seconds), partridge for (10 m) back and forth, from a standing position, bending and extending the knees for 20 seconds, forward dimensional stroke, sitting from lying down (30) seconds).

**Day Three:** Arms Bending and Stretching from the Tilted Position (10s), Playing Strokes on the Net, Nelson for the Transitional Motor Response of the Legs, Running (120m) from the High Start Position, Running (150m) from the High Start Position.

### 3.5.2 The Second Exploratory Experiment:

This experiment was conducted to verify the scientific parameters (consistency, honesty and objectivity) of the 15 tests candidates for application on a sample of (12) students, which is the same sample to which the first exploratory experiment was applied, as shown in Table (1).

#### First: The validity of the tests:

A questionnaire form that includes physical tests and tests of the sending and front stroke skills was presented to the teachers of racquet games, tests and measurement, and after collecting data, it became clear that all the tests candidates for work are suitable for the work sample, and thus the researcher obtained the truthfulness of the content.

#### Second: Stability of the tests :

Test stability refers to "its ability to give the same or close results if it is reapplied to the same individuals and under similar circumstances" (Al-Qaisi, 2020, 186), and the stability of physical tests and the tests of the transmission and badminton forward stroke skills were calculated by the method (test and retest) and Pearson's simple correlation coefficient law was used between the scores of the first and second measurements, it was concluded that all the tests had high stability since all their calculated values were With a significance level of (**Sig**) less than (0.05) and as shown in Table (1).

#### Third: Objectivity of the Tests :

The objectivity of the test is "the amount of differences between the results of two or more referees for the performance of an individual or individuals, and if the differences between the results of these two referees are few or non-existent, it indicates that this test has a high objectivity" (Darwish et al., 2002, 35). The value of Pearson's simple correlation coefficient between the scores of the first and second judgments of the total score of the two scales was calculated and it was concluded that all the tests were of high objectivity since all their calculated values were at the significance level of (**Sig**) less than (0.05) and as in Table (1) as well.

**Table (1) Truthfulness, Consistency and Objectivity of Tests Candidates for Analysis**

Significance	Sig	Objectivity	Sig	Stability	Tests	t
Moral	0.000	0.969	0.000	0.806	Bend and extend the arms from the inclined prone position 10 s	1
Moral	0.000	0.951	0.000	0.883	Front Rest, 15 seconds flexion and extension of arms	2
Moral	0.000	0.997	0.000	0.809	From a standing position, bend and extend the knees for 20 seconds	3
Moral	0.001	0.939	0.010	0.742	Partridge for 10 m round trip	4
Moral	0.000	0.915	0.002	0.850	Running 10m from high position	5
Moral	0.030	0.945	0.011	0.729	Running 20 m from high start	6
Moral	0.000	0.929	0.000	0.783	Nelson Selective Motor Response of the Legs	7
Moral	0.000	0.953	0.000	0.81	Sitting from Lying Down 30 Seconds	8

Moral	0.000	0.947	0.000	0.908	Bend and extend the arms from the procrastinate 30 seconds	9
Moral	0.002	0.932	0.010	0.774	Run 120 m from the high start position	10
Moral	0.001	0.918	0.015	0.720	Run 150m from High Start	11
Moral	0.000	0.996	0.000	0.731	Remote transmission accuracy	12
Moral	0.000	0.965	0.000	0.788	Short transmission accuracy	13
Moral	0.000	0.991	0.000	0.807	Forward Dimensional Strike	14
Moral	0.000	0.926	0.000	0.872	Playing Strikes on the Net	15

### 3.6 Main Experience:

The physical and skill tests were carried out and implemented on the work sample of (102) students of the faculties and departments of physical education and sports sciences of (Salah Al-Din – Erbil and Soran) universities in Erbil Governorate on Sunday, 15/12/2024, with (3) days for each college.

### 3.7 Statistical Methods:

The ready-made program (**IBM SPSS Statistics Ver 26**) was used to extract the following:

(Percentage, arithmetic mean, standard deviation, loom, torsion coefficient, Pearson's simple correlation coefficient, factor analysis by Harold Hötling's Fundamental Components Method with Kaiser's Varimax Orthogonal Rotation).

## 4 – Presentation and discussion of the results:

### 4.1 Specifications of Physical and Skill Tests Candidates for Analysis:

The researchers extracted the arithmetic averages, standard deviations, patterns, and torsion coefficient values for all physical tests and skill tests for the dispatch and forehand skills of badminton, as shown in the table (2).

### 4.2 Intercorrelation matrix for all tests candidates for factor analysis:

Table (3) shows the correlation matrix of all the 15 physical tests and skill tests for the 15 batting and forehand skills, which include (105) correlation coefficients that were not counted in the diagonal cells, of which (65) positive correlation coefficient (61.904%) and (40) negative correlation coefficient (38.095%)The matrix includes (16) significant correlation coefficients with a percentage of (15.238%), of which (8) are significant positive, and (8) significant are negative, while the non-significant correlation coefficients reached (89) with a percentage of (84.761%).

Table (2) Arithmetic Averages, Standard Deviations, Pattern and Torsion Coefficient for All Tests

Torsion coefficient	Looms	Standard deviation	Arithmetic mean	Unit of Measurement	Exam Name	t
- 0.54	10	1.68	9.08	Number	Bend and extend the arms from the inclined position 10 s	1
- 0.84	15	2.15	13.18	Number	Front Prop (15 seconds flexion and extension of the arms)	2
- 0.55	20	2.28	18.74	Number	From a standing position bend and extend the knees for 20 seconds.	3

- 0.57	7.72	0.33	7.53	Second	Partridge for a distance of (10 m) round trip.	4
0.71	2.43	0.21	2.58	Second	Run (10 m) from the high position.	5
- 0.14	3.75	0.21	3.72	Second	Run (20 m) of high start.	6
- 0.20	1.96	0.15	1.93	Second	Nelson for the selective motor response of the legs.	7
- 0.61	27	4.67	24.13	Number	Sitting from Lying Down 30 Seconds	8
- 0.80	28	3.37	25.29	Number	Bending and extending the arms of the procrastinate 30 s	9
0.46	22.38	0.54	22.63	Second	Run (120 m) from the high starting position.	10
- 0.61	29.88	0.76	29.41	Second	Run (150 m) from the high starting position.	11
- 0.62	33	7.43	29.20	Degree	Remote transmission accuracy.	12
0.23	25	5.80	26.35	Degree	Short transmission accuracy.	13
0.49	24	5.53	26.74	Degree	Forward Dimensional Strike.	14
- 0.22	18	3.74	17.17	Degree	Playing Strikes on the Net	15

Table (3) shows the matrix of intercorrelations of research variables

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	t
.03 1	- .17 4	.15 5	- .07 7	.07 4	.00 2	.20 6	.00 6	- .00 4	.02 7	- .09 0	- .22 7	- .00 9	- .16 0	1	1
.05 7	.02 5	.06 8	.14 6	- .04 7	- .10 9	- .01 9	- .03 4	.02 8	.28 4	.04 3	.18 3	.05 7	1		2
.20 9	.08 4	- .11 3	.06 1	.03 1	.00 4	- .14 7	.04 3	.08 7	- .07 8	- .12 3	.05 5	1			3
- .08 6	.12 2	- .03 2	.02 9	.19 8	- .09 3	- .08 1	- .03 4	.03 0	.00 6	.06 3	1				4
- .15 9	.08 9	.09 1	- .02 4	.09 5	.10 8	- .00 9	- .05 6	.00 0	.27 6	1					5
.03 9	- .29 2	- .03 3	- .13 1	- .06 8	- .09 4	.04 6	- .14 1	.01 3	1						6

.22 4	.00 0	.14 7	-.04 8	.10 3	.20 9	.13 1	.00 6	1									7	
-.04 2	.01 0	-.21 5	-.06 8	.01 5	.13 5	-.26 6	1											8
-.05 8	.01 6	.16 8	-.28 0	-.24 9	.00 8	1												9
.05 6	.22 9	.07 1	.11 6	.04 3	1													10
-.01 6	.03 7	-.25 6	.10 3	1														11
-.04 7	.13 4	.09 6	1															12
.21 5	.12 1	1																13
-.05 8	1																	14
1																		15

#### 4.3 Factor Results of Badminton Physical and Skill Tests Before Rotation:

The researchers used the Hotling Fundamental Components method, "a method preferred by Thomson to Thurston's centrifugal method because it derives the maximum correlation variance of the matrix" (Salman, 2016, 86), as well as its acceptance of **the Kaiser** method, which is characterized by stopping factor extraction when its latent root is less than the correct one" (Al-Qaisi, 2015, 54). It is noted that the first factor explained (11.606%) of the cumulative percentage of variance, the second factor explained (22.336%), the third factor (32.281%), the fourth factor (41.591%), the fifth factor (49.628%), the sixth factor (57.227%), and the seventh factor (64.349%), and it is also noted that the extracted factors are descending and according to their importance, as the percentage of factor variance reached The first factor is the total variance (11.606%), the second factor (10.730%), the third factor (9.945%), the fourth factor (9.309%), the fifth factor (8.037%), the sixth factor (7.599%), and the seventh factor (7.122%) as shown in Table (4).

Table (4) shows the factor matrix for physical and skill tests in badminton before rotation

Contrast Interpreter	Factors							Variables
	7	6	5	4	3	2	1	
.771	.617	.211	-.181	-.235	.332	.111	.367	1
.629	.082	.280	-.185	.305	.194	.614	.047	2
.623	-.051	.146	.142	.541	.499	-.186	-.055	3
.620	-.177	-.253	.454	.307	.461	-.016	-.110	4
.617	-.400	.382	.137	.011	-.186	-.327	.388	5
.630	-.145	-.411	-.022	-.167	.161	.038	-.296	6
.630	.117	.134	-.054	-.254	.584	.056	-.433	7
.455	-.007	.030	-.047	.466	.298	-.144	.353	8

.574	-.224	-.132	-.064	-.404	.480	.112	.311	9
.604	-.109	.342	.409	-.402	.284	-.219	.133	10
.830	.376	-.380	.566	.047	-.129	.040	.450	11
.576	-.085	-.410	-.010	.052	.054	.498	.383	12
.641	.483	.024	.258	.063	-.086	-.429	-.380	13
.751	.026	.333	.254	.307	-.217	.553	.358	14
.701	-.084	.200	.515	-.352	-.085	.503	.071	15
9.652	1.068	1.140	1.206	1.396	1.402	1.609	1.741	Latent root
	7.122	7.599	8.037	9.309	9.945	10.730	11.606	Importance of Factors %
	64.349	57.227	49.628	41.591	32.281	22.336	11.606	Cumulative Percentage %

#### 4.4 Factor Results of Badminton Physical and Skill Tests after Rotation:

The researchers used the orthogonal rotation method (Varimax for Kaiser) to rotate the factors, and thus the researchers reached (7) factors as well, and it is noted that the first factor explained (9.996%) of the cumulative percentage of variance, the second factor explained (19.803%), the third factor (29.423%), the fourth factor (39.014%) and the fifth factor. It is also noted that the extracted factors are descending and according to their importance, as the percentage of variance of the first factor for the total variance (9.996%), the second factor (9.808%), the third factor (9.620%), the fourth factor (9.591%), the fifth factor (8.640%), and the sixth factor (8.416%) and the seventh factor (8.280%) It is also noted that the values of the explained variance remained constant before and after the rotation process as shown in Table (5).

Table (5) shows the factor matrix of physical and skill tests in badminton after rotation

Contrast Interpreter	Factors							Variables
	7	6	5	4	3	2	1	
.771	.864	.086	.101	-.019	.041	-.061	.019	1
.629	.323	-.157	-.186	.188	.314	.574	.018	2
.623	-.001	-.104	.041	.769	-.121	.064	.014	3
.620	-.279	.246	.199	.597	.062	.044	.283	4
.617	-.188	-.117	.288	.056	.011	-.120	.683	5
.630	.357	-.217	-.014	-.077	-.026	-.087	.688	6
.630	.240	.284	.328	.138	-.068	.040	.574	7
.455	.148	.045	-.139	.572	.109	-.108	-.246	8
.574	.173	-.030	.370	.039	.549	-.285	.149	9
.604	.080	-.008	.753	.051	-.069	-.100	-.115	10
.830	.097	.896	.047	.036	-.024	-.043	-.104	11
.576	.034	.374	-.187	.000	.624	.081	.060	12
.641	.041	.152	.015	.043	.760	-.070	.177	13
.751	-.128	-.018	-.063	-.012	-.112	.847	.035	14
.701	-.080	.218	.505	-.301	.143	.524	.078	15
9.652	1.242	1.262	1.296	1.439	1.443	1.471	1.499	Latent root
	8.280	8.416	8.640	9.591	9.620	9.808	9.996	Importance of Factors %
	64.340	56.070	47.654	39.014	29.423	19.803	9.996	Cumulative Percentage %

#### 4-5 Interpretation and naming of factors:

The researchers relied on the conditions for the acceptance of the factor before interpreting the factors, based on the simple structure criteria, which are (the study variables are not saturated with a high saturation with only one factor, and the factor is interpreted in the light of the major saturations ( $\pm 0.5$ ) with the help of medium saturation ( $\pm 0.3$ ), and the factor that is saturated is accepted with at least three significant variables, according to the Guilford test ( $\pm 0.3$ ). (Faraj, 1980, 151), and the factors are interpreted in the light of the results of the orthogonal rotation in the interpretation of the results. (Al-Qaisi, 2015, 72), the best (3) tests are nominated with the highest saturation factor.

**- Explanation of the first factor:**

From Table (5), it is observed that (3) tests with great saturation were saturated by (20%) of the total number of tests analyzed, all of which were positive, while no test was moderately saturated, while (12) tests were poorly saturated (zero), and the percentage of the explained variance for this factor was (9.996), and the saturated tests in terms of order are (running (20 m) from the high start 0.688, running (10 m) from the high position 0.683, Nelson for the selective motor response of the two legs 0.574), and that the tests that It obtained the greatest saturation on the worker, characterized by fast running to cover a specific distance in the shortest possible time, and it is related to the quality of the transitional speed, as well as the Nelson test of the selective motor response of the two legs among the tests that obtained the greatest saturation, i.e. it shares the quality of speed as well, so the researchers believe that this factor **is called the transition speed factor**, and the researchers confirm that the transfer speed is one of the most important physical qualities of the badminton player, as it is not limited to fast running and moving from one place to another, but The badminton player needs it to distinguish the game from repeated movements and the multiplicity of sudden situations during the match, especially in the speed of sudden situations and according to the requirements of the game, and the speed of taking the space and the speed of moving to return to the defensive state or move to make a counterattack during the match, and the result reached by the two researchers is consistent with what he said (Ismail, 2016) when he defined the transitional speed as "moving from one place to another as quickly as possible, which means overcoming a certain distance in the shortest possible time" (Ismail, 2016, 337), and it agrees Allawi and Radwan, 2001) when he defined transitional speed as "the ability to move from one place to another in the shortest possible time" (Allawi and Radwan, 2001, 197), and it agrees with what (Mustafa, 2013) referred to (Adel Abdel Basir, 1999, p. 108) as "trying to move or move from one place to another as quickly as possible, i.e. trying to overcome a certain distance in the shortest possible time" (Mustafa, 2013, 47). It also agrees with (Asad, 2011) quoting Zuhair Qasim Khashab and others, 1999, 68) that "the speed gained after the starting speed in which the player tries to maintain it for as long as possible and according to the distance" (Asad, 2011, 91), and it agrees with what she refers to (Lafta, 2004) "The player needs the transitional speed because the correct expectation is not made in the absence of the speed of performance, so the better the speed, the better the prediction" (Lafta, 2004, 22), and this result is also consistent with what she has pointed out. Ismail, 2010) "The badminton player needs the element of speed in all its forms as the basis of the game strategy in order for the player to be able to move around the court... The importance of this quality is evident in the player's movement, and we find it required at every moment, as the player moves whether the feather is in his court or in the opponent's field, and whether the player is in a state of defense or in a state of attack, as the skill performance requires reverse movements as a result of the feather hit hard during the performance of the crushing strike and then touches the barrier wall to change its course" (Ismail, 2010, 29-43).

Since the best tests from a statistical point of view are (**running 20 m from the high start + running 10 m from the high position + Nelson for the selective motor response of the legs**), the researchers recommend these tests as one of the bases for selecting students to practice badminton.

#### - Explanation of the second factor:

From Table (5), it is observed that (3) tests with major saturation are saturated by (20%) of the total number of tests under analysis, all of which are positive, while no test is moderately saturated, while (12) tests are poorly saturated (zero), and the percentage of the explained variance for this factor is (9.808), and the saturated tests in terms of order are (forward dimensional stroke 0.847, front support bending and extending the arms for (15) seconds 0.0574, The tests that obtained the highest saturation on the factor are the first and third tests respectively, which obtained the highest saturations, related to the skill of the forward dimensional strike, while the second test that obtained the highest saturation is related to the characteristic force of the speed of the arms, so the researchers believe that this factor should be called the "frontal dimensional stroke **skill factor**" The researchers believe that the success and superiority of any badminton player must be proficient, proficient, and proficient in performing all the basic skills of badminton, including the forehand stroke, that the conclusion reached by the researchers is consistent with what he stated (Bateman, 1991) "that the forehand strike is the basic skill of any of the different racquet games and the most used in playing and training and is performed in many ways (straight, cross, low, high)" (Bateman, 1991, 47) The result is also consistent with what he pointed out (Abdul-Hussain, 2013) "that the goal of the strike is to bring the feather closer above the head and from the back playing area to the opposing field area, and the performance of this strike forces the opponent to return to the back area of his court and not make him control the center of play, and this makes him move away from the middle of the field, which makes the center of gravity of the body move backwards" (Abdul-Hussain, 2013, 41), as well as (Agha, 2007). The forehand strike is one of the basic and important strokes in badminton, as the players resort to exchanging play between them using the forehand, as this skill gives the player the appropriate strength and accuracy in returning the badminton, and due to the frequent repetition of this skill, we find that the majority of players master it well" (Agha, 2007, 72), and the researchers believe that many of the movements performed by the player on the court require him to have the distinctive strength of speed for the arms This is in line with what (Abul-Ela Ahmed, 1997) pointed out: "There is a direct correlation between the degree of skill mastery and the distinctive strength with speed, so the high level of skill performance can only be achieved by obtaining a high level of distinctive strength quickly" (Abdel Fattah, 1997, 133).

Since the best tests from a statistical point of view are ( **frontal dimensional stroke + front support, bending and extending arms for (15) seconds + playing strokes on the net**), the researchers recommend these tests as one of the bases for selecting students to practice badminton.

#### - Explanation of the third factor:

From Table (5), it is observed that (4) tests are saturated with a percentage of (26.666%) of the total number of tests under analysis, of which (3) have a high saturation and one test with medium saturation, while (11) tests are weakly saturated (zero), and the percentage of the explained variance for this factor is (9.620), and the saturated tests in terms of order are (short transmission accuracy). 0.760, long-distance transmission accuracy 0.624, bending and stretching of arms from procrastination (30) seconds, forward support bending and extending arms for (15) seconds 0.314), that the tests that got the greatest saturation on the factor were the first and second tests related to the skill of transmission, while the third test is related to the prolongation of the force and the fourth is related to the characteristic strength of the speed of the arms, which has already been dealt with by the second factor, so the researchers believe that this factor should be called **a factor** The result reached by the two researchers regarding the short serve skill is in line with what I have mentioned (Al-Jaf, 2005) quoting (Muhammad Muhammad Al-Beirut, 2004) "The short serve is either on the front or back side of the racket, which is the main and most used and the best in controlling the feather, and the short back serve forms the basis in doubles play with the aim of forcing the opponent to return the feather upwards, and the sender takes the

position of serving by standing directly behind the front serve line and close to the center line using the back grip of the racket, and the focus is on the edge of the top net so that the serve is as high as possible and the feather falls in the opponent's yard at the front serve line, and this type of serve gives the opponent less than 20% of the time to move and attack" (Al-Jaf, 2004, 56), while the accuracy of the long serve skill is very important for the badminton player to get points directly and he must master them, and this He agrees with what he said (Al-Khouli, 2001) "The sending player stands in the legal zone and approximately four feet away from the low serve line and is exactly adjacent to the midline so that the shoulder of the striking arm should be further back to allow a wide range of motion (the racket swing), and the striking action begins with a quick swing from the striking hand forward to strike the feather from the bottom up and forward to fly at a high altitude (high bow)(Al-Khouli, 2001, 121). This is in line with what (Al-Khafaji, 2000) quoted from (Essam Muhammad Amin, 1993) "that the more repetition of the skill, the more automatic and contradictory the tension becomes, and the more complete and efficient the movement becomes" (Al-Khafaji, 2000, 92).

Since the best tests from a statistical point of view are (short **transmission accuracy + distance transmission accuracy + bending and extending arms from lying down (30 seconds)**), the researchers recommend these tests as one of the bases for selecting students to practice badminton.

#### - Explanation of the fourth factor:

From Table (5), it is observed that (4) tests were saturated with a percentage of (26.666%) of the total number of tests under analysis, including (3) with great saturation and one test with medium saturation, while (11) tests were weakly saturated (zero), and the percentage of the difference explained for this factor was (9.591), and the saturated tests in terms of order are (from a standing position, bending and extending the knees for (20) seconds, 0.769, partridge for a distance of 10 meters round trip 0.597, and sitting from lying down (30) seconds. 0.572, Kicks of play on the net 0.301), that the tests that got the greatest saturation on the factor The first and second tests were related to the characteristic strength of the speed of the two legs, while the third test is related to the quality of the power extension and the fourth is related to the skill of the forward strike, which has already been dealt with by the second factor, so the two researchers believe that naming this factor (**the force factor characteristic of speed for the two legs**), the researchers confirm that Many of the movements performed by the player on the court require him to have the distinctive strength of speed for the legs, which is evident in most of the students' badminton movements, especially when performing repetitive movements that are performed at the same time with high speed and strength, which is consistent with what he pointed out (Al-Qaisi & Ismail, 2010) "Badminton is characterized by being a game that fluctuates conditions and events, such as differences in tension and effort from one moment to another, and it is characterized by sudden and fast movements such as spinning, jumping, and hitting, which we mean by hitting the feather with the racket" (Al-Qaisi & Ismail, 2010, 353), and it agrees with his definition (Kasmal, 2016) that "the ability of the muscular system to overcome resistances that require a high degree of speed of muscle contractions, where the force characterized by speed is seen as a combination of the component of muscular strength and the component of speed" (Ismail, 2016, 157), as well as with (Abu Zeid, 2005) "It is the ability to repeatedly overcome resistances using a high motor speed" (Abu Zeid, 2005, 270). It also agrees with what (Al-Khalidi, 2006) pointed out that "the most important thing that distinguishes outstanding athletes is that they possess a great deal of strength and speed and have the ability to link them in an integrated way to create a strong and fast movement in order to achieve optimal performance" (Al-Khalidi, 2006, 18), as well as (Shuaila, 2005) quoting (Muhammad Nasreddin Radwan and Ahmed Al-Mutawali Al-Mansour, 1999, p. 9) that it is the view of the specialist in the field of measurement in physical education, as it is a composite value, where it represents strength and speed Primary components for this ability, which are the most important motor abilities necessary for the

physical performance of special skills in sports activities and competitions in the championship sector" (Shuaila, 2005, 128), as well as what is indicated by (Al-Zaheri & Wagha, 2017) "One of the most important characteristics of outstanding athletes is that they possess a great deal of strength and speed and have the ability to link them in an integrated form to create a strong movement in order to achieve superior performance, as the strength associated with speed is of great importance in distracting The competitor" (Al-Zaheri, Waga, 2017, 281), as well as agrees with (Al-Jubouri, 1999) "The power of climbing, the power of hitting and running quickly is one of the components of the strength characterized by speed" (Al-Jubouri, 1999, 26), and also agrees with (Abdel Fattah, 1997) "There is a direct correlation between the degree of skill mastery and the strength characterized by speed, so the high level of skill performance can only be achieved by obtaining a high level of strength characterized by speed" (Abdel Fattah, Abul Ela Ahmed, 1997, 133). It also agrees with what she referred to (Al-Taie, 1999) quoting (Sareeh Abdul Karim, 1986, p. 26) "The strength characterized by speed, especially a physical motor of the elements of strength and speed, is characterized by the mutual correlation of different levels of strength characteristics and the characteristics of speed in line with the nature of the skill performance in the practiced activity, so as to ensure the highest effectiveness of this performance under the conditions and conditions of the competition" (Al-Taie, 1999, 92).

Since the best tests from a statistical point of view are **(from a standing position to bend and extend the knees for (20) seconds + partridge for (10 meters) back and forth + sitting from lying down for (30) seconds)**, the researchers recommend these tests as one of the bases for selecting students to practice badminton

**- Explanation of the fifth factor:**

From the table)5) Saturation Notes(4) Tests (26.666%) of the total number of tests analyzed Of which two tests are the same Major saturation Two tests were moderately saturated, while (11) tests were weakly saturated (zero), and the percentage of the explained variance for this factor was (8.640), which is in terms of order.Run (120m) from the high starting position 0.753, play on the net 0.505, bend and stretch arms from procrastination (30 sec) 0.370, Nelson for the selective motor response of the legs 0.327), that Tests that got the most saturation on the worker The first test was related to the prolongation of velocity, the second related to the skill of the forward strike, the third related to the prolongation of force, and the fourth related to the speed of response, and it is noted that this factor is complex and difficult to name and interpret, in addition to the fact that most of the tests have been saturated with previous factors, so the researchers believe that this factor should be neglected and its results should be excluded from the study.

**- Explanation of the sixth factor:**

From the table)5) Saturation is observed(2) Test by(13.33%) of the total number of tests analyzed All of them are positive, including one test with high saturation and one test with medium saturation, while (13) tests are weakly saturated (zero), and the percentage of the variance explaining this factor is (8.416), and the two tests that are saturated in terms of order are(150m run from 0.896 high starting position, transmission accuracyFar 0.374), that Tests that got the most saturation on the worker The first test was related to the quality of the speed prolongation and the second was related to the skill of transmission, and since the saturation observed on the worker did not achieve the specified number of acceptances of the worker, the researchers believe that this factor should be neglected and its results should be excluded from the Final Battery Vocabulary To select fourth-grade students in badminton, according to Guilford's  $\pm 0.3$ , as noted by (Safwat Faraj 1980), "a factor that is saturated with at least three significant variables is accepted." (Faraj, 1980, 151).

**- Explanation of the seventh factor:**

From the table)5) Saturation Notices(3) Tests by(20%) of the total number of tests analyzed All of them are positive, including one test with high saturation and (2) with medium

saturation, while (12) tests are poorly saturated (zero), and the percentage of the variance explained for this factor is (8.280), and the saturated tests in terms of order are (Bending and extending arms from inclined position (10 seconds) 0.864, jogging (20 m) from high start 0.357, forward leaning and stretching arms for 15 seconds 0.323) that Tests that got the most saturation on the worker The first test was related to the characteristic force of speed of the arms, the second related to the characteristic of the transitional velocity, and the third related to the characteristic force of speed of the arms, and it is noted that this factor is complex and difficult to name and interpret, in addition to the fact that the tests have been saturated with previous factors, so the researchers believe that this factor should be neglected and its results should be excluded from the study.

## **5 – Conclusions and Recommendations:**

### **5 – 1. Conclusions:**

- 1- Harold Hötling's method of basic components was found to be (7) factors that were rotated perpendicularly to Kaiser 's Varimax method and (7) factors were also reached.
- 2- In light of the conditions of the acceptance of the worker, (4) factors were accepted and named as (the first factor is the transition speed, the second factor is the forward dimensional strike, the third factor is the sending skill, and the fourth factor is the strength of the speed of the two legs).
- 3- The fifth and seventh factors have been neglected because they measure a complex component that is difficult to name and interpret.
- 4- The results indicate that the sixth factor using the orthogonal rotation did not achieve the specified number of factor acceptance, so it was neglected.
- 5- The tests that obtained the highest saturation on their factors were nominated as follows:  
**The first factor:** running (20m) from the high start + running (10m) from the high position + Nelson for the selective motor response of the legs.  
**The second factor:** the front dimensional stroke + the front support bending and extending the arms for (15) seconds + the strokes playing on the net.  
**The third factor:** the accuracy of the short transmission + the accuracy of the long transmission + the bending and extension of the arms from the procrastination (30) seconds.  
**The fourth factor:** from the standing position, bend and extend the knees for (15) seconds + partridge for (10 meters) back and forth + sitting from lying down for (30) seconds.

### **5 – 2. Recommendations:**

- 1- Researchers and trainers should be interested in the results of this study and work on developing physical and skill qualities by selecting the students of the faculties of physical education and sports sciences in badminton.
- 2- Re-conducting the study with the same variables and using the oblique rotation method.
- 3- Conducting a similar study in other variables and aspects of badminton related to physical, functional and psychological measurements, which were not addressed in the current study for different levels and age groups and for both sexes.

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