Factorial Structure for a Battery of Skill Tests Football Attackers Under 17 Years old

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Abstract:

This study aimed to construct a battery of skill tests for football attackers under 17 years old in the regional first teams of Annaba scientifically, using factor analysis. The descriptive method was employed, with a sample size of 14 players. The study involved the application of 30 skill tests, and the results were processed using factor analysis with spss software. Five factors were extracted, representing three core skills (scoring, ball control, dribbling), Consequently, we recommend the use of the derived test battery units in evaluating football attackers.

KEY WORDS : Factor Analysis; Battery; Attackers; Football

الملخص:

هدفت هذه الدراسة إلى بناء بطارية اختبارات مهارية لدى مهاجمين كرة القدم تحت 17 سنة لفرق الجهوي الأول عنابة بطريقة علمية، بإستخدام التحليل العاملي، وقد استخدمنا المنهج الوصفي وبلغت العينة 14 لاعبا وشملت الدراسة على تطبيق (30) اختبار مهاري، حيث تم معالجة النتائج بالتحليل العاملي باستخدام برنامج spss، وتم إستخلاص (05) عوامل والتي تعبر عن (03) مهارات أساسية (التهديف، الإخماد، الجري بالكرة) ، وعليه نوصي باستخدام وحدات بطارية الاختبار المستخلصة في تقويم لاعبي الهجوم في كرة القدم.

الكلمات المفتاحية: التحليل العاملي ؛ البطارية، ؛ لاعبوا الهجوم ؛ كرة القدم

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1-**Introduction and Research Problem** :

In recent years, coaching science has rapidly evolved due to multiple studies applying modern scientific theories in sports training. The aim is to elevate players to a level enabling them to meet the demands of modern play. Essential among these requirements is skillful performance in football. To achieve optimal speed in executing these skills during matches, coaches must focus on selecting exercises mirroring in-game scenarios. This necessitates gradual performance training, allowing players to become accustomed to executing with the same strength and speed required in matches (Hassan, 2011: 30), Mohamed Shouky and Al-Basati (2000) highlight that skill development is fundamental in football training, Mastery of skill performance indicates a player's overall skill capacity, The skillful achievement of a player involves a set of integrated motor performances with and without the ball, requiring physical, cognitive, and psychological capabilities to produce the appropriate performance for the playing situation (Mohamed Shouky, Al-Basati, 2000: 167). Objective tests are crucial in physical education and sports assessment, They play a prominent role in diagnosis, classification, and evaluation, revealing strengths and weaknesses in skills that need assessment in players, Many experts and coaches seek objective tests precisely measuring skill attributes in football, Tests involve standardized questions and measures where individuals respond, and results are processed to provide a quantitative comparison of individual performance levels (Marwan, 2001: 15).

 Local evaluation studies, such as those by Baungartner (1999) and Morrow (2000), affirm that tests are optimal tools for assessment and comparison between individuals, Previous studies by Mohamed (2017), Latif (2018), and Hakim (2021) indicate that most coaches rely on observation, personal experience, and competitive interviews to evaluate and assess players, neglecting scientific methods such as tests and measurements.

 Despite the material and human resources allocated by the state to serve scientific development in recent years, enriching sports training with modern assessment tools for elevating both general physical and specific skill characteristics, researchers note a lack of systematic player evaluation processes, This absence is particularly evident in the neglect of standardized skill tests, as highlighted by Al-Bassati (1995) He emphasizes the importance of evaluation in its simple concept,

involving the verification of the value of something and the judgment of this value through test scores and measures to understand the changes resulting from the preparation and training process (Al-Bassati, 1995: 213), Moreover Ali (1994) indicates a significant connection between excellence in performing positions and playing lines in football and players' motor skills, along with their ability to execute offensive and defensive tactical duties (Ali, 1994: 84). Therefore, it becomes evident that it is not only crucial for coaches or educators to comprehend the content of training but also to understand how to evaluate this training. This involves selecting appropriate test batteries aligned with the requirements of playing positions. Hence, the overarching question posed is: What type of test battery can be used, following scientific criteria, to measure the skill abilities of football attackers under 17 years old?

 General Hypothesis:
 The test battery that can be used, following scientific criteria, to measure the skill capabilities of football attackers under 17 years old aligns with the positional requirements of the attacking line.

2- General objective of the study:

- Identify skill trait factors indicated by skill tests in football attackers under 17 years old using factor analysis.
- Nominate skill tests to infer skill trait factors in football attackers under 17 years old, derived from factor analysis.
- Construct a skill test battery for football attackers under 17 years old.

3- Procedural definition of the concepts mentioned in the research:

- **Factor Analysis:** The process of categorizing digital data obtained from tests using correlation coefficients between different variables, It is analyzed to discover general and specific factors connecting these variables to each other (Hassanein, 1996: 412, 413).
- **Battery:** Defined by Mohamed Sobhi Hassanein (2001) as "a set of standardized or applied tests on the same individuals, with derived standards allowing for comparison" (Sobhi Hassanein, 2001: 41).
 - **Test:** Defined by Mohamed Sobhi Hassanein (2001) as questions or skills presented to the person to be tested (Hassanein,2001: 20).

- **Attackers:** The players closest to the opponent's goal, with the primary duty of scoring goals, Attackers can be further categorized into those creating goals and making crucial passes for others, retaining possession in the opponent's areas to seize scoring opportunities (Dehbazi, 2014: 60).

4- The methodological procedures used in the study:

4-1 Method and tools:

- **Adopted Approach:** Descriptive method using the survey approach due to its suitability for the nature of the research.
- **Survey Study:** Before conducting the survey experiment, the researcher conducted interviews with specialists to discuss the division of tests into groups. The agreement was to divide them into two groups performed over several days, ensuring scientific sequencing and allowing muscle recovery between each test. The skill tests were conducted on five players from January 2, 2023, to January 16, 2023, with a subsequent reapplication after two weeks on the same group during the period from February 1, 2023, to February 15, 2023. The purpose was to understand the nature of the tests, identify potential challenges faced by the researcher and the assisting team, assess their competence in executing and recording the skill tests, evaluate the time required for their implementation, and determine the effectiveness of the tools utilized.
- **Sample and Selection Methods:** The study's sample consisted of 14 attackers under 17 years old from the first regional teams in Annaba (Mouloudia Berrahal and Jil Tacha).
- **Study Domains:**
 - **Human Domain:** Football players, attackers under 17, from two regional teams in Annaba (Mouloudia Berrahal, Djil Tacha).
 - **Temporal Domain:** The study took place from February 26, 2023, to March 23, 2023.
 - **Spatial Domain:** The study occurred in the teams' respective fields.
 - **Study Tools:**
* Literature in both Arabic and foreign languages.
* Pedagogical methods.
* **Skill Tests:** The study relied on 30 skill tests.
 - **Scientific Basis for Skill Tests:**

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* Validity:

- Content Validity: Tests were presented to a group of experts in sports training who expressed agreement on the validity of the skill tests used in the study.

- Self-Validity: Measured by calculating the square root of the test stability coefficient (Nasr al-Din Ridwan, 2006: 2).

* Reliability:

- Stability Coefficient: Researchers applied and reapplied the tests to a sample of 5 attackers under 17 years old from the same study population to determine the reliability coefficient.

Table N°1: Reliability and Validity Coefficients for Skill Tests Among Football Attackers Under 17 Years Old

Tests	Reliability Coefficient	Self-Validity
Passing the ball toward a goal drawn on the ground	*0.78	0.80
Medium-range pass	*0.80	0.91
Receiving the ball rebounded from a marker	*0.81	0.94
Shooting the ball toward a goal drawn on a wall	*0.77	0.78
Kicking the ball for the farthest distance	*0.88	0.90
Maneuvering the ball towards a small goal 20 m away	*0.86	0.88
Maneuvering towards a small goal 10 m away	*0.81	0.83
Dribbling the ball around five markers	*0.78	0.95
Rolling between ten markers	*0.79	0.82
Rolling 30 m and continuously scoring five times	*0.77	0.79
Zigzag dribbling with the ball in figure-eight shape	*0.89	0.91
Rolling the ball between markers from the goal line to the penalty area and back to the goal line	*0.85	1.00

Running 30 m with the ball	*0.83	0.88
Fast running with the ball	*0.77	0.90
Shooting the ball toward a goal drawn on a wall	*0.78	0.99
Scoring with balls	*0.84	0.89
Accuracy in shooting at the goal	*0.79	0.81
Shooting at the goal from the penalty area	*0.87	0.96
Scoring from movement	*0.77	0.79
Kicking the ball on target	*0.80	0.82
Receiving and maneuvering	*0.83	0.85
Stopping the ball	*0.91	0.94
Stopping the ball with movement	*0.94	0.98
Controlling the ball in a specific distance	*0.78	0.79
Stopping the ball with the chest	*0.89	0.97
Ball control in the air	*0.95	0.98
Ball control within a circle with time calculation	*0.88	0.90
Ball control bouncing for a distance of 20 meters	*0.79	0.89
Controlling, sensing, and maneuvering the ball for 30 seconds	*0.94	0.95
Ball control	*0.98	1.00

Source: Compiled by Researchers (2023)

The correlation values range between 0.77 and 0.98, and self-validity values range from 0.78 to 1.00, all surpassing the tabulated correlation value estimated at 0.63, The results appear promising, indicating a high level of stability and self-validity in the correlation coefficients of football skills tests and self-report measures.

- **Statistical Tools:** Descriptive statistics, standard deviation, skewness coefficient, Pearson correlation coefficient, factor analysis

using the Principal Components method, and for factor extraction, orthogonal rotation through the Varimax method were employed.

4-2 Presentation and Analysis of Results:

4-2-1 Suitability of Skill Test Data:

To ensure the suitability of the research variables represented by the skill tests for factor analysis, descriptive statistics were performed on these variables, encompassing mean, standard deviation, and Fisher's skewness, Table N°2 illustrates the descriptive statistics for skill test results of attackers under 17 years old.

Table N°2: Descriptive Statistics for Skill Test Results of Attackers Under 17 Years Old

Symbol	Variable Description	Mean	Standard Deviation	Skewness
A1	Passing the ball toward a goal drawn on the ground	50,143	9,718	0,696
A2	Medium-range pass	19,786	3,490	0,994
A3	Receiving the ball rebounded from a marker	13,143	4,383	-0,125
A4	Shooting the ball toward a goal drawn on a wall	26,214	6,117	-0,199
A5	Kicking the ball for the farthest distance	36,889	3,183	-0,435
A6	Maneuvering the ball towards a small goal 20 m away	5,286	1,437	-0,403
A7	Maneuvering towards a small goal 10 m away	4,071	0,917	0,542
B1	Dribbling the ball around five markers	23,024	0,486	0,033
B2	Rolling between ten markers	22,532	0,552	-0,982
B3	Rolling 30 m and continuously scoring five	58,593	1,769	-0,230

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	times			
B4	Zigzag dribbling with the ball in figure-eight shape	8,024	0,541	-0,166
B5	Rolling the ball between markers from the goal line to the penalty area and back to the goal line	12,409	0,535	-0,597
B6	Running 30 m with the ball	6,660	0,510	-0,308
B7	Fast running with the ball	12,800	0,412	0,212
C1	Shooting the ball toward a goal drawn on a wall	65,786	13,566	0,061
C2	Scoring with balls	18,571	1,399	0,321
C3	Accuracy in shooting at the goal	4,643	0,745	-0,572
C4	Shooting at the goal from the penalty area	8,643	0,745	-0,572
C5	Scoring from movement	7,214	0,699	-0,321
C6	Kicking the ball on target	16,929	0,997	-0,382
D1	Receiving and maneuvering	4,500	0,519	0,000
D2	Stopping the ball	8,286	1,326	-0,151
D3	Stopping the ball with movement	6,286	1,326	-0,151
D4	Controlling the ball in a specific distance	72,143	11,883	0,164
D5	Stopping the ball with the chest	5,071	0,730	-0,113
E1	Ball control in the air	95,978	8,044	0,374
E2	Ball control within a circle with time calculation	8,571	1,089	-0,212
E3	Ball control bouncing for a distance of 20 meters	12,114	0,744	0,150

| E4 | Controlling, sensing, and maneuvering the ball for 30 seconds | 38,929 | 13,482 | 0,017 |
| E5 | Ball control | 7,071 | 1,269 | -0,153 |

Source: Compiled by Researchers (2023)

This table provides detailed statistics for skill test results of attackers under the age of 17, encompassing mean, standard deviation, and skewness for each variable, reflecting the proficiency in various football skills.

From Table (01), it is evident that the skewness coefficients range between (1±), indicating that the results of skill tests for attackers under 17 years old are normally distributed.

4-2-2 Factor Analysis of Skill Tests for Attackers Under 17 Years Old: Factor analysis was conducted on skill tests for attackers under 17 years old, In the initial stage, the intercorrelation matrix was extracted using Pearson's simple correlation coefficient, Subsequently, factors were extracted from the correlation matrix using Principal Components Analysis.

4-2-3 Factor Matrix for Skill Tests of Attackers Under 17 Years Old after Orthogonal Rotation: During this stage, employing Orthogonal Rotation through the Varimax Method, 10 factors were identified, Following criteria for factor acceptance and construction standards, which involve accepting factors with a saturation equal to or exceeding 0.50 on three or more variables, five factors were accepted, The table below illustrates this.

Table N°3 : Factor Matrix for Skill Tests of Attackers Under 17 Years Old

v	Factor									
	1	2	3	4	5	6	7	8	9	10
A1	-0,907	-0,040	-0,056	0,136	0,099	0,229	-0,065	-0,159	-0,143	0,071
A2	0,837	-	-	-	0,027	-0,094	-0,123	-	-	0,064

		0,032	0,240	0,111				0,367	0,235	
A3	0,733	-0,373	0,177	0,234	0,218	-0,193	0,078	0,019	-0,203	-0,053
A4	0,701	-0,193	0,328	0,099	0,269	0,283	-0,356	-0,036	-0,145	0,022
A5	-0,536	-0,127	0,408	-0,211	-0,313	-0,048	0,248	-0,186	-0,254	0,362
A6	0,499	0,333	-0,091	0,495	-0,293	0,058	0,041	0,116	-0,119	-0,455
A7	-0,012	0,902	0,112	-0,010	-0,078	-0,144	-0,010	-0,068	-0,179	0,095
B1	-0,117	0,882	0,020	0,031	0,024	0,223	-0,033	0,114	-0,058	-0,079
B2	0,045	-0,703	-0,366	0,149	-0,143	0,139	-0,011	-0,461	-0,101	0,164
B3	0,310	0,441	0,347	0,421	0,211	-0,372	-0,096	-0,115	-0,210	-0,061
B4	-0,138	-0,077	-0,845	0,122	-0,066	-0,255	-0,005	-0,060	-0,077	0,080
B5	-0,008	0,167	0,724	0,065	0,256	-0,047	-0,145	-0,202	-0,283	0,012
B6	-0,278	0,077	0,706	0,361	0,070	0,235	-0,297	0,156	0,210	0,055
B7	-0,076	-0,232	-0,540	-0,159	0,178	0,494	0,250	-0,148	0,456	0,029
C1	-0,233	0,059	-0,154	0,832	-0,103	-0,085	-0,156	0,196	-0,014	0,005
C2	0,401	-0,156	0,109	0,738	0,176	0,007	0,245	-0,335	-0,039	-0,024
C3	0,108	-	0,225	0,666	-	0,163	-0,001	0,115	-	0,236

	0,036			0,108				0,556	
C4	-0,525	-0,361	0,327	0,560	0,121	-0,248	0,117	0,106	0,120	-0,145
C5	-0,013	-0,143	0,074	0,373	-0,805	-0,273	0,096	-0,009	-0,014	0,220
C6	0,162	-0,250	0,139	0,123	0,805	0,097	-0,009	-0,128	0,015	0,007
D1	-0,051	0,227	0,263	0,073	0,801	-0,122	0,067	0,345	-0,035	0,264
D2	-0,138	-0,119	0,149	-0,039	0,078	0,877	-0,054	0,235	0,055	-0,122
D3	-0,088	0,447	0,353	0,011	0,181	0,734	0,233	0,043	0,126	0,065
D4	0,029	-0,183	-0,171	-0,059	-0,069	0,017	0,925	0,058	-0,066	-0,091
D5	-0,291	0,196	-0,120	0,141	0,036	0,058	0,794	0,178	0,367	0,039
E1	-0,020	0,274	-0,044	0,052	0,020	0,148	0,103	0,909	-0,051	-0,170
E2	0,021	-0,444	0,012	0,162	0,087	0,290	0,194	0,682	0,277	0,199
E3	-0,113	-0,236	-0,012	-0,087	-0,069	0,122	0,058	0,137	0,927	0,031
E4	0,018	0,113	0,393	0,016	0,152	0,252	0,274	-0,335	0,525	0,524
E5	0,077	0,061	0,317	-0,103	0,055	0,224	0,542	0,051	0,034	-0,717

4-3 Discussion and interpretation of Extracted Factors:

* Factor 1:

Table N°4: illustrates the variables that saturated on Factor 1

Symbol	Variable	Saturation Value
E2	Ball control within a circle with time calculation	-0.907
C4	Shooting towards goal on the penalty area wall	0.837
C1	Shooting the ball towards a wall-drawn goal	0.733
C3	Accuracy of shooting on goal	0.701
E1	Ball control in the air	-0.536

It shows that five variables representing (16.67%) of the total variables, out of 30 variables, saturated on Factor 1, Through the saturation rankings, it appears that the variables saturated on Factor 1 include three shooting skill tests and two ball control skill tests.

The diversity in saturations indicates that this factor is a sectarian factor, with a factor interpretive variance of 16.956%.

This factor is polarized, as some tests saturated with positive values while others with negative values, This suggests that players achieving high scores in shooting skill tests (shooting on goal from the penalty area, shooting the ball towards a wall-drawn goal, accuracy of shooting on goal) obtain low scores in ball control tests (ball control within a circle with time calculation, ball control in the air). Considering the significance of scoring skills, the researcher suggests naming this factor the "Scoring Factor."

To represent scoring skills, the shooting test on goal from the penalty area was nominated.

* Factor 2:

Table N°5: illustrates the variables that saturated on Factor 2

Symbol	Variable	Saturation Value
B5	Rolling the ball between markers from the goal line to the penalty area and back to the goal line	0.902
E3	Ball control and bouncing for a distance of 20 meters	0.882
D1	Reception and handling	-0.703

The variables saturated on Factor 2 include three variables representing (10.00%) of the total variables, out of 30 variables, The variables are one test each for running with the ball, ball control, and damping.

Due to the highest saturation of the rolling the ball test, the researcher suggests naming this factor the "Running with the Ball Factor".

The rolling the ball test was selected to represent running with the ball in the battery of tests for football attackers under 17 years old.

* Factor 3:

Table N°6: illustrates the variables that saturated on Factor 3

Symbol	Variable	Saturation Value
D4	Ball control in a specific distance	-0.845
C5	Scoring from movement	0.724
E5	Ball control	0.706
E4	Control, sense, and ball control within 30s	-0.540

The variables saturated on Factor 3 include four variables representing (13.33%) of the total variables, out of 30 variables, Through the saturation rankings, it appears that the variables saturated on Factor 3 include two tests related to ball control, one test related to damping, and one test related to scoring.

Due to the highest saturation of the ball control in a specific distance test, the researcher suggests naming this factor the "Damping Factor". The ball control in a specific distance test was selected to represent the damping factor in the battery of tests for football attackers under 17 years old.

* Factor 4:

Table N°7: illustrates the variables that saturated on Factor 4

Symbol	Variable	Saturation Value
B6	Running 30m with the ball	0.832
A3	Receiving rebound from a board	0.738
D5	Stopping the ball with the chest	0.666
B1	Curved running with the ball around markers	0.560

The variables saturated on Factor 4 include four variables representing (13.33%) of the total variables, out of 30 variables, Through the saturation rankings, it appears that the variables saturated on Factor 4 include two tests related to running with the ball, one test related to passing, and one test related to damping.

To overcome the tests related to running with the ball, the researcher suggests naming this factor the "Running with the Ball Factor".

Due to the highest saturation of the running 30m with the ball test, it was nominated to represent the running with the ball factor in the battery of tests for football attackers under 17 years old.

* Factor 5:

Table N°8: illustrates the variables that saturated on Factor 5

Symbol	Variable	Saturation Value
C6	Rolling 30m and continuous scoring five times	0.805

	Test	Value
B3	the ball into the goal	-0.805
B2	Rolling between ten markers	0.801

The variables saturated on Factor 5 include three variables representing (10.00%) of the total variables, out of 30 variables, Through the saturation rankings, it appears that the variables saturated on Factor 5 include two tests related to running with the ball and one test related to scoring.

To overcome the tests related to running with the ball, the researcher suggests naming this factor the "Running with the Ball Factor".

Due to the highest saturation of the rolling 30m and continuous scoring five times test, it was nominated to represent the running with the ball factor in the battery of tests for football attackers under 17 years old.

4-4 Nominating the Skill Test Batteries for Football Attackers Under 17 Years Old:

Table N°9: shows the skill test batteries for football attackers under 17 years old.

	Test	Measurement Unit	Factor	Factor Name
1	Shooting on goal from the penalty area	Score	1	Scoring Factor
2	Rolling the ball between markers from the goal line to the penalty area and back to the goal line	Seconds	2	Running with the Ball Factor
3	Ball control in a specific distance	Seconds	3	Damping Factor
4	Running 30m with the ball	Seconds	4	Running with the Ball Factor

5	Rolling 30m and continuous scoring five times	Seconds	5	Running with the Ball Factor

Conclusion:

Based on the factor analysis results using Varimax rotation for the applied skill tests on under-17 football attackers in Annaba, the following findings were reached:

- ✓ (05) five factors for the core skills were identified through the skill tests:
- The first factor is the skill of scoring goals.
- The second factor is the ball dribbling skill.
- The third factor is the skill of ball control.
- The fourth factor is the ball running skill.
- The fifth factor is the ball running skill (again).
  - ✓ The skill tests representing these factors were nominated for inferring the skill traits of under-17 football attackers, derived from the factor analysis:
- Shooting test from the penalty area representing the first factor (Scoring skill).
- Rolling the ball between markers from the goal line to the penalty line and back to the goal line representing the second factor (Ball running skill).
- Ball control in a specified distance representing the third factor (Control skill).
- Running 30 meters with the ball representing the fourth factor (Ball running skill).
- Rolling 30 meters and continuously scoring five times representing the fifth factor (Ball running skill).
  - ✓ Skill battery units were constructed to evaluate the attacking players in football.

Recommendations:

Researchers recommend the following:

1- Utilize specialized training methods for each player position and its requirements.

2- Emphasize the importance of acquiring core skills at an early stage to ensure their refinement.

3- Propose a skill test battery specific to playing positions for national-level application. Overall, these results and recommendations

underscore the significance of developing the skills of young football attackers and integrating training to achieve outstanding performance.

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