

PREDICTION OF SHOOTING ABILITIES FROM THE SELECTED KINANTHROPOMETRIC, PHYSICAL AND PHYSIOLOGICAL VARIABLES AMONG WOMEN SOCCER PLAYERS

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ABSTRACT

Back Ground: This research aimed to predict shooting talents in female football players using kinanthropometric, physical, and physiological data. The study's goal was to discover significant parameters influencing shooting talents and to create prediction models for player performance.

Methods: The research included 360 female football players ranging in age from 18 to 25 from different institutions in Tamil Nadu, India. The kinanthropometric, physical, and physiological variables were measured using specific instruments and techniques, and their interrelationship with shooting ability was analyzed using regression analysis and structural equation methods. The findings indicated significant correlations between shooting ability and variables such as leg length, arm length, speed, balance, and cardiorespiratory endurance. Multiple regression analysis identified these variables as strong predictors of shooting ability, with leg length and arm length being the best kinanthropometric predictors, and speed, balance, and cardiorespiratory endurance as the best physical predictors.

Results: The research emphasised the importance of focus in shooting skill, emphasising how it affects a player's performance. The study indicated that players with high shooting abilities had a better chance of progressing in their professional careers, and coaches may utilise these

data to identify youngsters with more potential for professional football. This is especially helpful for young female players who are still honing their shooting abilities.

Conclusion: In summary, the study aimed to predict shooting abilities in women soccer players by analysing their anthropometric, physical, and physiological characteristics. The findings suggested that specific variables, such as leg length, arm length, speed, balance, and cardiorespiratory endurance, play crucial roles in predicting shooting ability. The research also underscored the importance of concentration in shooting performance and its implications for player development and talent identification.

Kew words: Kinanthropometric, Physical, Physiological, Shooting Abilities, Women Soccer Players

1. Introduction

One of the most fundamental steps in any multistep sport program is to evaluate the player's performance, within different areas ^[1]. Nevertheless, in team sports, performance is not simple to measure ^[2] and selection is known to be as a complex process (often unstructured) ^[3]. The concept of 'talent' is still very complex to pinpoint, although it has been suggested that it consists of trying to identify, right from the earliest developmental stages, which players could become elite ^[4]. In team sports, this prediction about the player's potential performance is more complex than in individual sports because of the involvement of genetic, physiological, morphological, psychological, and environmental factors ^[5&6].

Ross et al. (1978)^[7] defined kin anthropometry as the application of body measurements to the study of human size, shape, proportion, composition, maturation and gross functions so as to help to understand human movement in relation to growth, exercise, performance and nutrition. For a football team, there are many important factors for success and it is difficult to detach anthropometric, physical and physiological characteristics as crucial factors in sports performance^[8], which is an important component of the athletes' individualized and periodized training process^[9]. One of the goals of scientific research is to predict future events or result from present or past data. Prediction can be used for the purpose of evaluation, a player's future success in a specific area or skill can be predicted by using proper evaluation. The present status in a particular skill area is used to predict future success in that same area participants in various aspects could be advised into activities in which they have the greatest chance of success through prediction.

2. Purpose of the Study

The purpose of the study was to identify the prediction of shooting abilities from the selected kinanthropometric, physical and physiological variables among women soccer Players.

3. Research Methodology

The research paper used a prospective research design to investigate the relationship between soccer shooting ability and various kinanthropometric, physical, and physiological variables. A sample of 360 subjects aged 18 to 25 years from colleges in Tamilnadu, India, who participated in intercollegiate competitions, was chosen for the study. Kinanthropometric measurements, such as body weight, foot length, arm girth, arm length, and hip girth, were taken using specific instruments. Additionally, physical variables including agility, balance, flexibility, and speed, as well as physiological variables like breath-holding time, were measured using standardized tests. The shooting ability was assessed using the Mor Christian soccer skill test.

4. Data Analysis and Findings

The data collected were analysed using mean and standard deviation calculations for the selected variables. Regression analysis and structural equation modelling were used to determine the inter-relationship between the kinanthropometric, physical, physiological variables, and shooting ability. The study identified statistically significant correlations between certain kinanthropometric, physical, and physiological variables with shooting ability, which were then used to develop respective linear predictive models. This study provides valuable insights into the interplay of various physical attributes and soccer shooting ability, offering potential applications for player training and development.

5. Analysis of the Data

The data of each of the independent variables selected under kinanthropometric physical and physiological variables and shooting ability were analysed and presented below.

Table 1: Descriptive statistics of selected kinanthropometrical, physical, physiological variables and shooting ability among women soccer players

S. No	Variables	Mean (N=360)	Std. Deviation (SD ±)	N
1	Arm girth relaxed (cm)	26.67	3.88	360
2	Arm girth flexed (cm)	31.77	4.56	360
3	Arm length (cm)	77.12	4.18	360
4	Biceps (mm)	8.40	1.96	360
5	Body weight (kg)	62.97	5.69	360
6	Calf girth (cm)	31.53	4.64	360
7	Foot length (cm)	23.50	1.12	360
8	Hip girth (cm)	93.14	7.12	360
9	Leg length (cm)	93.89	7.34	360
10	Standing height (cm)	171.14	4.80	360
11	Shoulder width (cm)	46.54	1.08	360
12	Thigh girth (cm)	45.73	2.27	360
13	Triceps (mm)	11.70	3.60	360
14	Supraspinale (mm)	11.36	2.40	360
15	Agility (sec)	21.37	2.08	360
16	Balance	37.30	2.14	360
17	Cardio respiratory endurance (meter)	1546.95	170.52	360
18	Flexibility (cm)	35.00	1.82	360
19	Hand eye coordination (sec)	23.99	1.169	360
20	Leg explosive power (cm)	1.57	.213	360
21	Leg eye coordination (sec)	15.41	1.73	360
22	Speed (sec)	7.64	.73	360
23	Speed endurance (sec)	20.50	.81	360
24	Breath holding time (sec)	32.14	2.23	360
25	Resting heart rate (bpm)	15.97	.72	360
26	Respiratory rate (numbers)	70.06	1.23	360
27	VO ₂ Max (bpm)	38.92	1.81	360
28	Shooting (points)	27.92	9.77	360

Table 1 showed the descriptive statistics – Range, Minimum, Maximum, Mean and Standard deviation of kinanthropometric, physical, physiological characteristics and shooting, of women soccer Players. The inter relationship between selected kinanthropometric, physical and physiological variables among shooting ability was computed using Pearson product moment correlation was presented in the Table 2.

Table 2

Inter-correlation of selected kinanthropometrical, physical, physiological on shooting among women soccer players

S. No	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃	X ₁₄	X ₁₅	X ₁₆	X ₁₇	X ₁₈	X ₁₉	X ₂₀	X ₂₁	X ₂₂	X ₂₃	X ₂₄	X ₂₅	X ₂₆	X ₂₇
C.	.06	.04	.06	.06	.06	.05	.02	.04	.35	.22	.03	.02	.00	.01	.01	.11	.08	.07	.01	.04	.06	.12	.00	.07	.08	.09	.04
R	5	3	0	2	2	9	1	4	3	6	2	8	7	7	0	5	2	4	5	3	2	7	8	2	4	7	5
X ₁	1.00	.03	.06	.04	.02	.04	.04	.03	.04	.19	.00	.07	.01	.06	.02	.09	.00	.06	.00	.03	.07	.01	.03	.08	.05	.02	.01
X ₂		1.00	.02	.04	.02	.03	.03	1.00	.03	.00	.00	.00	.01	.08	.00	.05	.10	.09	.04	1.00	.04	.03	.08	.09	.03	.03	.05
X ₃			1.00	.01	.02	.01	.04	.02	.65	.69	.00	.01	.02	.01	.01	.01	.02	.05	.05	.02	.01	.08	.02	.02	.01	.07	.00
X ₄				1.00	.04	.99	.00	.04	.03	.00	.00	.00	.09	.04	.05	.03	.11	.00	.00	.04	.05	.00	.07	.03	.00	.01	.00
X ₅					1.00	.04	.09	.03	.01	.03	.01	.04	.06	.07	.09	.03	.03	.01	.12	.03	.02	.03	.05	.03	.02	.01	.05
X ₆						1.00	.00	.03	.03	.00	.00	.00	.09	.04	.05	.02	.11	.00	.00	.03	.04	.00	.07	.03	.00	.01	.00
X ₇							1.00	.03	.06	.01	.02	.13	.02	.00	.01	.00	.05	.00	.07	.03	.00	.04	.00	.03	.03	.01	.00
X ₈								1.00	.03	.00	.00	.00	.01	.08	.00	.05	.10	.09	.04	1.00	.04	.03	.08	.09	.03	.03	.05
X ₉									1.00	.80	.01	.00	.01	.06	.05	.00	.09	.04	.00	.03	.07	.03	.11	.05	.03	.00	.02
X ₁₀										1.00	.05	.06	.05	.00	.00	.00	.09	.04	.01	.00	.03	.01	.07	.07	.03	.02	.05
X ₁₁											1.00	.06	.06	.05	.00	.03	.06	.02	.03	.00	.03	.07	.06	.01	.11	.02	.03
X ₁₂												1.00	.06	.02	.03	.01	.02	.04	.04	.00	.04	.02	.01	.00	.02	.04	.04

	00	6	8	5	0	3	7	6	2	3	9	9	2	5	3	3
X13		1.0	.13	.04	.02	.02	.00	.04	.01	.10	.04	.07	.11	.07	.04	.06
	00	9	3	1	7	3	3	7	5	0	7	7	3	0	8	
X14		1.0	.00	.00	.02	.01	.03	.08	.00	.01	.02	.00	.05	.01	.04	
	00	7	1	3	7	0	5	3	0	1	3	0	1	8		
X15		1.0	.00	.05	.03	.04	.00	.09	.03	.01	.04	.00	.03	.12		
	00	1	4	5	0	7	6	2	1	8	5	3	5			
X16		1.0	.02	.12	.01	.05	.08	.02	.02	.01	.09	.05	.02			
	00	2	3	4	4	6	0	5	2	4	0	7				
X17		1.0	.05	.03	.10	.07	.02	.06	.05	.02	.00	.04				
	00	0	1	1	5	6	6	2	5	1	6					
X18		1.0	.05	.09	.03	.06	.01	.03	.05	.06	.04					
	00	0	9	3	2	3	6	9	6	4						
X19		1.0	.04	.00	.06	.03	.05	.05	.01	.10						
	00	1	5	2	2	6	0	9	0							
X20		1.0	.04	.04	.08	.09	.03	.03	.05							
	00	2	0	6	1	5	7	4								
X21		1.0	.00	.03	.05	.04	.00	.05								
	00	0	7	3	5	5	6									
X22		1.0	.05	.13	.00	.03	.08									
	00	2	2	2	0	6										
X23		1.0	.00	.01	.00	.01										
	00	3	5	3	8											
X24		1.0	.02	.09	.01											
	00	2	5	3												
X25		1.0	.01	.02												
	00	4	7													
X26		1.0	.00													
	00	6														

X₂₇

1.0
00

*Significant at 0.05 level of confidence

C.R	Shooting ability	X ₁₄	Supraspinale Girth
X ₁	Arm girth Relaxed	X ₁₅	Agility
X ₂	Arm girth Flexed	X ₁₆	Balance
X ₃	Arm Length	X ₁₇	Cardio respiratory endurance
X ₄	Biceps Girth	X ₁₈	Flexibility
X ₅	Body weight	X ₁₉	Hand eye coordination
X ₆	Calf Girth	X ₂₀	Leg explosive power
X ₇	Foot Length	X ₂₁	Leg eye coordination
X ₈	Hip Girth	X ₂₂	Speed
X ₉	Leg Length	X ₂₃	Speed Endurance
X ₁₀	Standing Height	X ₂₄	Breath holding time
X ₁₁	Shoulder Width	X ₂₅	Resting Heart rate
X ₁₂	Thigh Girth	X ₂₆	Respiratory Rate
X ₁₃	Triceps Girth	X ₂₇	VO ₂ Max

Table 2 shows that the there was a correlation exists between the shooting ability of women soccer players with leg length (X₉), arm length (X₃), speed (X₂₂), balance (X₁₆), and cardio respiratory endurance (X₁₇).

The result shows that selected kinanthropometric, physical and physiological variables such as leg length ($r=0.035$), arm length ($r=0.022$), speed ($r=0.000$), balance ($r=0.001$), and cardio respiratory endurance ($r=0.022$) were significantly correlated with the shooting ability the required 'r' value of 0.11 was found at 0.05 level of confidence.

Table 3
Step-wise multiple regression between shooting ability and independent variables of women soccer players

Model	Variables	R	R Square	Adjusted R Square	Std. Error of the Estimate
		R Square Change	F Change	df1	df2
1	Leg Length	.752	.125	.122	9.154
2	Arm Length	.850	.177	.172	8.892
3	Speed	.990	.206	.199	8.746
4	Balance	.992	.219	.210	8.686

5	Cardio respiratory endurance	.786	.230	.219	8.634
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From Table 3, it was found that the multiple correlations co-efficient for predictors, such as leg length (0.752), arm length (0.850), speed (0.990), balance (0.992), and cardio respiratory endurance (0.786) which produce highest multiple correlations with shooting ability. 'R' square values show that the percentage of contribution of predictors to the shooting ability.

Table 4

Regression analysis of prediction equation of women soccer players					
Model		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(constant)	72.067	6.201		.000
	Leg length	.470	.066	.353	.000
2	(constant)	42.490	8.685		.000
	Leg length	.732	.085	.551	.000
	Arm length	.703	.149	.301	.000
3	(constant)	22.452	10.189		.028
	Leg length	.766	.084	.576	.000
	Arm length	.774	.148	.332	.000
	Speed	2.320	.643	.172	.000
4	(constant)	41.912	12.925		.001
	Leg length	.764	.083	.575	.000
	Arm length	.767	.147	.328	.000
	Speed	2.347	.639	.174	.000
	Balance	.518	.214	.114	.016
5	(constant)	20.575	15.840		.195
	Leg length	.769	.083	.578	.000
	Arm length	.768	.146	.329	.000
	Speed	2.355	.635	.175	.000
	Balance	.564	.214	.124	.009
	Cardio respiratory endurance	1.464	.636	.108	.022

From the table 4 the following regression equations were derived for shooting ability among women soccer players.

Regression Equation in obtained scores form = CR

$$\text{Shooting Ability (CR)} = -72.067 + 0.769(X_9) + 0.768(X_3) + 2.355(X_{22}) + 0.564(X_{16}) + 1.464 (X_{17})$$

The regression equation for the shooting ability includes leg length (X_9), arm length (X_3), speed (X_{22}), balance (X_{16}), and cardio respiratory endurance (X_{17}).

The kinanthropometric variables leg length and arm length was found to be the best predictor for shooting ability among women soccer players.

Among the physical variables speed, balance and cardio respiratory endurance was found to be the best predictor for shooting ability among women soccer players

6. Discussion

The purpose of the research was to look at prospective metrics for predicting shooting talent among female football players based on their kinanthropometric, physical, and physiological condition. The results revealed a link between shooting skill and a variety of characteristics such as leg length, arm length, speed, balance, and cardiorespiratory endurance. These traits have been discovered as possible indicators of shooting skill in female football players. attention was identified as an important component impacting a player's ability to shoot, since aiming towards the goal requires a high degree of attention to prevent being impacted by external and internal distractions. The study also cited prior studies that emphasised the relevance of attention and focus in the development of excellent shooting skills, demonstrating that concentration is important in sports such as Football.

7. Conclusion

The study looked at the association between physical characteristics and shooting skill in female football players. The researchers discovered that indicators such as leg length, arm length, speed, balance, and cardiorespiratory endurance exhibited strong multiple associations with shooting skill. The 'R' square values represented the predictors' percentage contribution to shooting skill. According to the data, female football players with great shooting abilities have the ability to grow in their professional careers. Furthermore, the study emphasises the possibility for coaches to discover people with better potential to play professional football by analysing their shooting skills, especially in young female players whose shooting powers are still growing.

Statement of Ethics

The study protocol was reviewed and approved by the Manonmaniam Sundaranar University Doctoral committee members. All participants provided written informed consent form to participate in this study.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interests with respect to the research, authorship, and/or publication of the article prediction of shooting abilities from the selected kinanthropometric physical and physiological variables among women soccer players

References

1. Nevill, A., Atkinson, G., & Hughes, M. (2008). Twenty-five years of sport performance research in the Journal of Sports Sciences. *Journal of sports sciences*, 26(4), 413-426.
2. Reilly, T. (2001). Assessment of sports performance with particular reference to field games. *European Journal of Sport Science*, 1(3), 1-12.
3. Lidor, R., Falk, B., Arnon, M., Cohen, Y., Segal, G., & Lander, Y. (2005). Measurement of talent in team handball: the questionable use of motor and physical tests. *The Journal of Strength & Conditioning Research*, 19(2), 318-325..
4. Abbott, A., & Collins, D. (2004). Eliminating the dichotomy between theory and practice in talent identification and development: considering the role of psychology. *Journal of sports sciences*, 22(5), 395-408.
5. Pearson, D. T., Naughton, G. A., & Torode, M. (2006). Predictability of physiological testing and the role of maturation in talent identification for adolescent team sports. *Journal of science and medicine in sport*, 9(4), 277-287.
6. Williams, A. M. (2000). Perceptual skill in soccer: Implications for talent identification and development. *Journal of sports sciences*, 18(9), 737-750.
7. Ross, W., Hebbelinck, M., & Faulkner, R. (1978). Kinanthropometry terminology and landmarks. *Physical Fitness Assessment. Principles, Practice and Application*. Springfield, Illinois: Charles C. Thomas, 44-50.
8. Sutton, L., Scott, M., Wallace, J., & Reilly, T. (2009). Body composition of English Premier League soccer players: Influence of playing position, international status, and ethnicity. *Journal of Sports sciences*, 27(10), 1019-1026.

9. Lukaski, H. C. (Ed.). (2017). Body composition: health and performance in exercise and sport. CRC Press.
10. Kumar V., & Arumugam S. (2019). Pre dominant factors in assessing the passing abilities from the selected kinanthropometric, physical and physiological variables among women soccer players, Journal of Information and Computational science; 9(7), 117-122.
11. Kumar V., & Arumugam S. (2019). Prediction of dribbling ability from the selected Kinanthropometric physical and physiological variables among women soccer players, Adalya Journal, 8(8), 323-327.
12. Kumar V., & Arumugam S.(2020). Relationship Between Anthropometric Characteristics and Playing Ability among Women Soccer Players, Journal of Xidian University, 14(3), 1048-1052.
13. Nakano, N., Inaba, Y., Fukashiro, S., & Yoshioka, S. (2020). Basketball players minimize the effect of motor noise by using near-minimum release speed in free-throw shooting. Human Movement Science, 70, 102583.
14. Tan, Z. S., Burns, S. F., Pan, J. W., & Kong, P. W. (2020). Effect of caffeine ingestion on free-throw performance in college basketball players. Journal of Exercise Science & Fitness, 18(2), 62-67.
15. Utama, A. Z., Hariyanto, E., & Sudjana, I. N. (2016). Pengaruh latihan kelincahan dan kelentukan terhadap keterampilan dribbling sepakbola SSB PAS-ITN Kabupaten Malang. Jurnal Pendidikan Jasmani, 25(1), 31-38.
16. Komarudin YH. Psikologi Olahraga. Bandung: Remaja Rosda Karya, 2013.
17. Mulia, R. (2019). Hubungan Tingkat Konsentrasi dengan Kemampuan Shooting pada Pemain Sepakbola Ps. Lambhuk Tahun 2018. ETD Unsyiah.