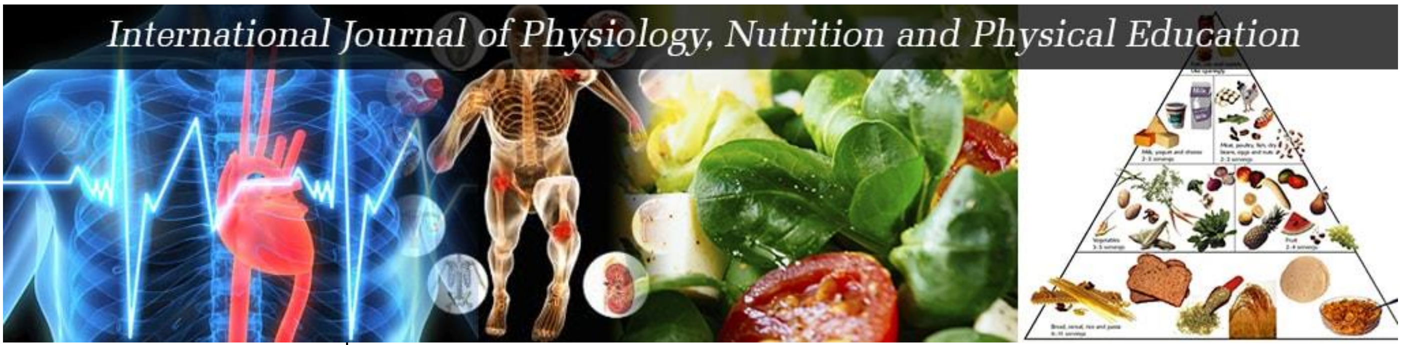

ISSN: 2456-0057
IJPNPE 2022; 7(1): 24-28

www.journalofsports.com
Received: 16-11-2021
Accepted: 18-12-2021

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A study on physiological variables of cricket players to develop talent identification model for cricket in Nepal

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Abstract

Background: Higher performance in sports is significantly determined by physiological capacities and body composition variables. Talent identification process is most important to upgrade the sports performance and physiological variables plays vital role to identify talent in sports. Very few studies have been conducted on talent identification in cricket. The main aim of the study is to identify physiological variables of cricket players for developing talent identification model.

Methods: The study is a descriptive study and convenient sampling method is used to select the subjects. Standard tools and test have been used to collect data of total 200 male cricket players of age (14-17 years) from 10 different cricket academies of Nepal.

Results: Results of the study showed that physiological variables are very important to develop talent identification model for cricket.

Conclusion: On the basis of result, it is found that four most important physiological variables should be taken instead of taking too much variables while identifying talent in cricket.

Keywords: physiological variable, factor analysis, talent identification, eigen value, variance

Introduction

The physical, morphological, technical, tactical and physiological requirements of cricket have drastically changed at all levels especially at elite level. To cope with these evolutions within the game, cricket players have to develop physiologically to meet the physical standard requirements of the elite level. The research in this area has gained popularity in recent decades, where numerous attempts to develop talent identification criteria have been made. But until, there is no theoretical framework which could be universally accepted. Present study endeavors to focus on developing objective, scientific and parsimonious talent identification criteria based on physiological variables in cricket.

Sport talent identification is the process of recognizing current participants with the potential to become elite players. It entails predicting performance over time by measuring physical, physiological, psychological and social attributes as well as technical abilities, either in isolation or in combination (Williams & Reilly, 2000) [18]. It is well generalized and published in various journals recently, that the sports events are mostly dependent on the Physique of an individual (Rico-Sanz, 1998) [14]. Studies have shown that there is significant relationship between many of the physiological variables with the cricket performance. So, for identifying the talent for cricket it is important to emphasis on physiological variables.

Higher performance in sports is significantly determined by physiological capacities and body composition variables. Every sports activity has unique physiological requirements, further there is huge difference in predicting performance based on physiological capacities for open and closed loop sports. The performance in closed loop sports (100 meter, marathon running, swimming etc.) can easily be predicted quantitatively, but the performance in open looped sports (hockey, football, cricket, kabaddi, kho-kho etc.) is affected by numerous factors, which affect the predictive power**.** Cardio respiratory endurance (Vo_2max) can be predicted with accuracy using lower heart rate, heart rate reserve, and relative work power capacity of the field hockey players (Hanjabam, & Jyotsna 2017) [7]. Further resting pulse rate could predict hockey playing ability and should be considered while attempting to identify talent infield hockey (Suthamathi, & Suganthi 2014) [16].

(Reilly 2009; Gabbett 2000; Reilly, & Borrie 1992) [6, 13] suggested a range of physiological variables and the variables having strong genetic influence played a huge role in talent identification such as vo_2 max, aerobic fitness. Elite and senior field hockey players are significantly better in body mass index, anaerobic power, higher triglycerides, total cholesterol, high density lipoprotein, low density lipoproteins and lesser percentage body fat (Manna *et al*. 2010) [12].

Previous studies had suggested that physiological variables played an important role in determining the performance of an individual, without desired level of physiological components for the concerned game we cannot expect the higher performance in the competition at higher level. These studies on physiologicalcal components indicated that importance of physiological components is not negligible (Burr, *et al*., 2008) [3]. In this study, the researcher intended to find out the required physiological variables for cricketers to develop talent identification model.

Rationale of the Study

Talent identification is the process of identifying the young raw players with the potential to become high level players in the future. Physiological variables are broadly used to identify the talent for a particular sport. So, it is very important to find out physiological variables required for cricketers. Hence, in the study, the researcher tries to find out physiological variables to develop talent identification model for cricket.

Methods

The study is a descriptive study. Total 200 junior cricket players were selected from ten different cricket academies (20 from each) of Nepal. The convenient sampling method was used to select the subjects. Standard tools and test were used to collect the data for selected 5 physiological variables.

Reliability and Validity: Reliability of the tests and Testers competency was evaluated together by test- retest method and result was obtained by Product Moment Correlation (Gogia 2002; Dubey 2006) [20].

Researcher introduced himself and explained the purpose of the study to the players and demonstrated the 5 test items of the research before starting data collection. Subjects were instructed to follow the activities for each test and the score was noted on the score card.

Statistical Analysis

Factor analysis was applied on the data obtained on junior cricket players to find out the factors and the variables with highest factor loading to develop a model. Factor analysis is used to measure latent/unobservable construct or constructs by focusing on large number of observable instances.

Results

Table 1: KMO and Bartlett's Test of sphericity for physiological variables

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.628**
Bartlett's Test of Sphericity	Approx. Chi-Square	577.185
	Df	10
	Sig.	.000

Above table 1 reported KMO value, along with Bartlett's test. The KMO value (.628), concluded that the sample size taken for the present study & for applying factor analysis was sufficient. If the value of KMO test found less than.05 than the null hypothesis might be rejected and the inference could be drawn that number of samples were not sufficient. Further Bartlett's test of sphericity revealed significance value (p value).000 was significant at.05 level of significance, which concluded that the correlation matrix and identity matrix are different which ascertained the reliability of the model.

Table 2: Total Variance Explained by the Physiological Factors

Component	**Initial Eigenvalues**			**Extraction Sums of Squared Loadings**		
	Total	**% of Variance**	**Cumulative%**	**Total**	**% of Variance**	**Cumulative%**
1	2.578	51.564	51.564	2.578	51.564	51.564
2	1.107	22.141	73.705	1.107	22.141	73.705
3	.862	17.238	90.943			
4	.399	7.977	98.919			
5	.054	1.081	100.000			
Extraction Method: Principal Component Analysis.						

The table 2 showed eigenvalues for each physiological variable, the extracted factors and the explained variance by these factors. As one can see in the table the eigenvalue for first two factors was more than 1, hence two factors were retained as their eigenvalue was more than 1. The eigenvalue for factor one was 2.578 and 1.107 for factor two evident from the table above. It can also be seen that after rotation the first factor explained 51.564% and second factor explained 22.141%, of the entire variance. Thus both the factors jointly explained 73.705% of the whole variance.

Table 3: Component Matrix: Unrotated Factor Solution

	Component	
	1	**2**
Resting Pulse Rate	.279	.735
Percent Body Fat	.754	-.442
Basal Metabolic Rate	.965	-.059
Skeletal Muscle Mass	.942	-.019
VO2 MAX	.334	.606
Extraction Method: Principal Component Analysis.		

Table 3 showed initial un-rotated factor solution for physiological variable, five variables were divided into two extracted factor according to the most important variable with similar response in factor one and simultaneously in factor two. The factor loadings for each of the variable on the extracted factors have been shown in the table. Since the solution is obtained from before rotation, as a result some variables might show their contribution in more than single factor. This problem was sorted out using varimax rotation to get the final corrected rotated solution.

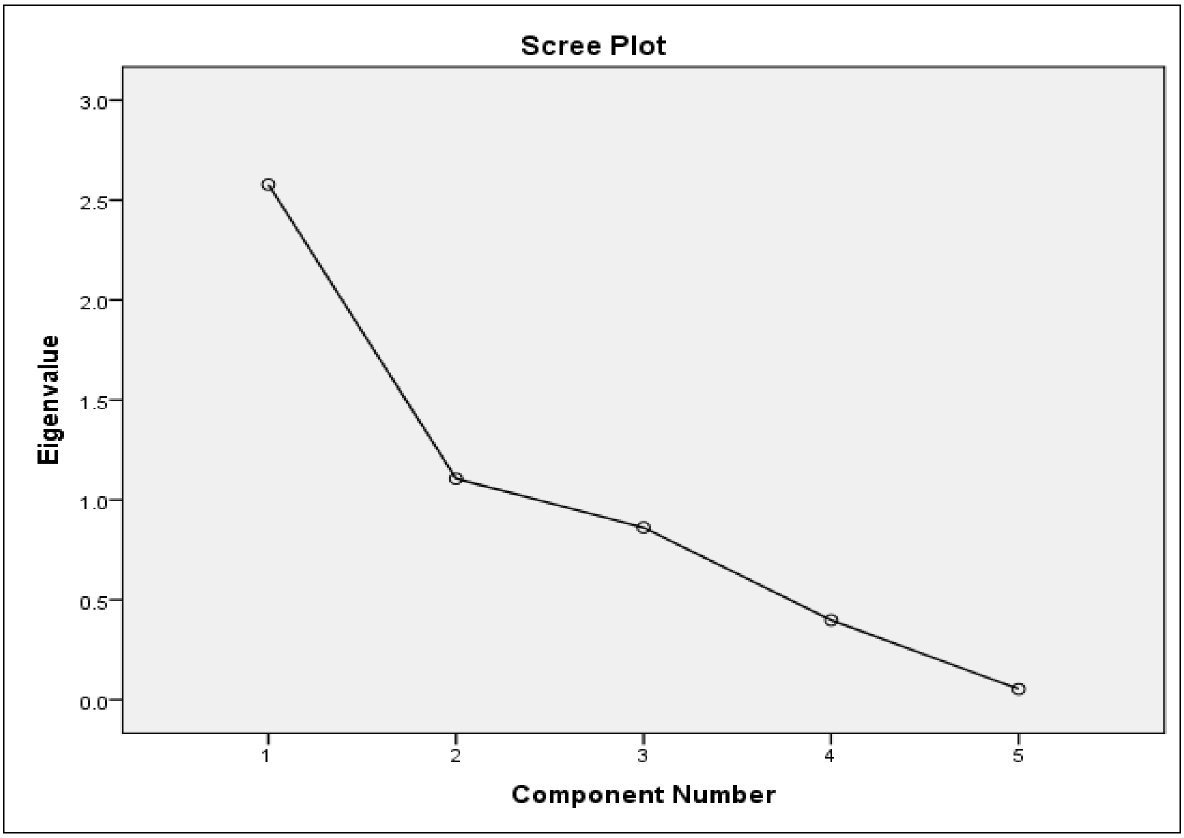

Fig 1: Scree Plot for physiological variables

Figure 1 above showed eigenvalues for each physiological variable plotted on y axis against the factors on x-axis. Plot showed the clear picture regarding number of variables to be retained, two factors were retained before elbow bent having eigenvalue more than 1. Note: the curve started flattening after second factor and also all exceeding factors were having eigenvalue less than one, hence were not selected for final analysis as they explained insufficient variance.

Table 4: Rotated Component Matrix: Varimax Rotated Solution

	Component	
	1	**2**
Resting Pulse Rate	.046	.8
Percent Body Fat	.852	-.196
Basal Metabolic Rate	.939	.233
Skeletal Muscle Mass	.905	.264
VO2_MAX	.137	.678
Extraction Method: Principal Component Analysis.		

Table 4 provided final corrected solution after applying varimax rotation, which enable the variables to appear in one factor only. The variables were to be identified in two factors on the basis of this final rotated solution obtained, in the present problem investigator has identified the variables with loadings equals to or more than.8. Owing to this criterion variables were grouped in each of the two factors as shown in (Table-5 & 6). Hence three variables percent body fat, basal metabolic rate and skeletal muscle mass were selected in factor one whereas also one variable resting pulse rate was selected into factor two.

Identification of variables into two different extracted factors

Table 5: Factor 1: Body composition

S. No.	Items	Loadings
1	Percent Body Fat	.852
2	Basal Metabolic Rate	.939
3	Skeletal Muscle Mass	.905

The factor 1, in the table 5 contained variables body fat and skeletal muscle mass which reflects body composition hence the factor was named as "Body composition factor". The variables loaded on factor one were having higher factor loading >.8 thus one might concluded that the extracted variables significantly explained the factor.

Table 6: Factor 2: Aerobic power

S. No.	Items	Loadings
1	Resting Pulse Rate	.800

The factor 2, in the table 6 contained one variable Resting Pulse Rate, thus could be termed as "Aerobic power factor". The variable explained the factor well.

Table 7: Talent identification criteria based on physiological factor

S. No.	Items	Loadings
1	Percent Body Fat	.852
2	Basal Metabolic Rate	.939
3	Skeletal Muscle Mass	.905
4	Resting Pulse Rate	.800

Table 7 gave talent identification criteria to identify talent in youth male cricket on the basis of physiological capacities. Investigator had thoroughly studied and statistically interpreted different physiological variables and found that four variables percent body fat, basal metabolic rate, skeletal muscle mass & resting pulse rate were most important in explaining group characteristics based on physiological variables, instead of studying too many variables. The model so developed comprehensively included physiological factors ranging from aerobic power to body composition and thus explains 88.168%.

Discussion

Present research endeavor was focused to develop an objective and most parsimonious physiological variables based talent identification criteria in cricket. Investigator had thoroughly studied and statistically analyzed, five different physiological variables and found four variables were most important in explaining group characteristics based on physiological, instead of studying too many number of variables. The model so developed comprehensively included all different physiological measurements i.e. ranging from aerobic power to body composition and thus explains 88.168%.of the total variance in defining talent based on physiological variables.

Different five physiological variables were subjected to the factor analysis and evident from figure 1 revealed that two factors could be extracted namely body composition and aerobic power, as they were having eigenvalue more than one and on the basis of correlation among the variables, explainability of the factor and loading of the variables on the factor. Three variables percent body fat.852, basal metabolic rate.939 and skeletal muscle mass.905 were selected into factor one named as "body composition", based on factor loading of ≥.8 in explaining the factor (Table 5). Single variable resting pulse rate.800 was extracted into factor 2 named as "aerobic power" based on loading of ≥.8 in explaining the factor (Table 6). Finally talent identification criteria based exclusively on physiological variables was suggested, four variables percent body fat.852, skeletal muscle mass -.905, basal metabolic rate.939 and resting pulse rate -.800 (Table 7), were selected from two different factors body composition and aerobic power. Hence investigator had suggested that instead of studying too many variables, these four variables may be focused for talent identification in cricket based on physiological variables.

The result of the present study was in line with the study of Asteya (2015) [19] a talent identification model to identify talent in squash and revealed physiological variable body fat percent was important to identify squash talent. In the same way (Bril 1980; Volkov & Filin 1983; Koley, Ayra-Petyan 1991; Bishop *et al*., 2016; Koley *et al*., 2012) [1, 17, 10] found that physiological variables are important to identify talent. The present study also supports those studies. The developed model will help to identify talent in cricket.

Conclusion

Sport talent identification is the process of recognizing current participants with the potential to become elite players. Physiological variables are broadly used to classify an individual and to identify the talent for a particular sport. So, it is very important to find out physiological variables required for cricketers. From result of this study, it was found that physiological variables are very important to identify talent in cricket and four variables included in the model (percent body fat, basal metabolic rate, skeletal muscle mass & resting pulse rate) explains 88.168%.of the total variance in defining talent based on physiological variables.

Limitations of the Study

The present study has taken only 200 subjects which is small sample size for generalizing the results. Therefore, future study could be on a large sample size. In the present study, convenient sampling method was used which will limit the generalization. Hence, future study could be on other sampling methods.

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