

Correlational Analysis of Physical Fitness by Norm Referenced and Criterion Referenced Standards



Physical Education

KEYWORDS : Physical fitness, Norm-referenced assessment, Criterion-referenced standards, t-score, composite score, scientific ranking.

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ABSTRACT

The objective of the study was to explore the relationship between Norm-referenced and Criterion-referenced standard scores on selected physical fitness components. In the present study, 125 male students ranging the age between 22 and 23 years were randomly selected from Visva-Bharati University, India as the subjects. The selected fitness parameters for the study were speed, leg explosive strength, agility and endurance. For the assessment of physical fitness of the subjects against norm-referenced standard, LNUPE norms were used. Further, criterion-referenced standard of the fitness scores was set converting them into t score and computing the composite score followed by ranking of the same. Finally, the data were analyzed by applying Pearson's Product Moment Correlation method for obtaining the Coefficient of Correlation in order to determine the relationship between Norm-referenced and Criterion-referenced Standards of scores. The level of significant was set at 0.05. The correlation between Norm-referenced and Criterion-referenced standard of Physical Fitness scores was 0.05 > (0.994).

Introduction:

Evaluation is a decision-making process that focuses on changes that have been taken place. It involves collecting suitable data (measurement); judging the value of these data according to some standard; and finally making decisions based on these data. The two most widely used types of standards are criterion and norm referenced. Glaster (1963) explained that scores on testing instruments can provide two kinds of information. One is related to the degree to which the student has attained a particular level of skill, determined by criterion-referenced standards. In contrast, norm-referenced standards are concerned to the hierarchical order of individual student. Statistical procedures are used to develop norm-referenced standards, often simply called norms. Norm-referenced standards are used to judge an individual's performance in relation to the performances of other members of a well defined group.

Both types of standards can be used to judge performance in Physical Education. The selection should depend upon the type of decision to be made. But usually in fitness testing norm-referenced standards are widely used. In fact, criterion-referenced standards are useful for setting performance standards for all students while norm-referenced standards are valuable for comparisons among individuals when the situation requires a degree of selectivity.

But to assess the performance of certain group on which population norms are not established or to facilitate the immediate result, criterion-referenced standards may be proved more useful subject to a high correlation with norms. Under the circumstances, it was thought worthwhile to establish relationship between the norm and criterion-referenced standards of physical fitness scores.

Objectives of the study:

The objectives of the study were to

- compute individual fitness score on each component comparing against norms;
- compute composite fitness score of every individual by normative evaluation;
- convert obtained data on each fitness component to t-scores to get composite fitness score of each individual out of selected physical fitness parameters;
- compute composite fitness score of every individual by criterion-referenced evaluation;
- explore the relationship between norm-referenced and criterion-referenced fitness scores on selected parameters.

Hypothesis:

It was hypothesized that there would be significant relationship between norm-referenced and criterion-referenced evaluation standards on selected fitness parameters.

Methodology:

Subject: One hundred twenty five (125) boys between the age group of 22 and 23 years were selected at random from the Department of Physical Education, Visva-Bharati as the subjects of the study.

Parameters: Four physical fitness parameters were selected for the study namely, Speed, Leg Explosive Strength, Agility and Endurance.

Criterion Measures:

Sl. No.	Parameters	Test used	Measures in
1	Speed	50m Dash	1/10 th of second
2	Leg Explosive Strength	Standing Broad Jump	Meter
3	Agility	4x10m Run	Minute
4	Endurance	600m Run and Walk	Minute

Statistical Method:

- Descriptive statistics was used to assess homogeneity of groups;
- Standard t-score was used to compute composite scores;
- Pearson's Product moment correlation was employed in order to find out the relationship of physical fitness scores computed by norm-referenced and criterion-referenced standards;
- The level of significance was set at 0.05.

Analysis and Interpretation of Data:

Findings:

The Mean value and Standard deviation of obtained scores, after converting against Norms and Criterion-referenced scores on selected physical fitness components of subjects have been presented in Table 1.

Table 1

THE MEAN AND STANDARD DEVIATION OF SELECTED PHYSICAL FITNESS COMPONENTS AND AFTER CONVERTING AGAINST NORMS OF SUBJECTS

Parameters		Mean	SD
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50m Dash (sec.)*	OS	7.37	0.53
	NRS	5.81	1.67
	CRS	50.02	9.95
Standing Broad Jump** (mts.)	OS	2.18	0.24
	NRS	4.98	1.54
	CRS	50.14	9.99
Shuttle Run (sec.)*	OS	9.97	0.63
	NRS	5.84	2.24
	CRS	49.95	9.94
600m Run & Walk* (min.)	OS	1.87	0.32
	NRS	2.54	1.66
	CRS	50.05	9.97

SD= standard deviation;

OS=obtained score;

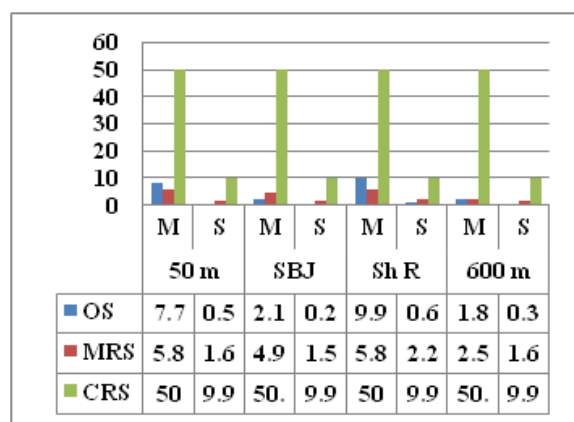
NRS=norm-referenced score; CRS=criterion-referenced score.

*Less the score better the performance.

** Higher the score, better the performance.

It is evident from Table 1 that the mean and SD of obtained scores on selected physical fitness components were found 7.37 ± 0.53 , 2.18 ± 0.24 , 9.97 ± 0.63 and 1.87 ± 0.32 ; the mean value and SD on each selected components after computing against norms were found 5.81 ± 1.67 , 4.98 ± 1.58 , 5.84 ± 2.24 and 2.54 ± 1.66 respectively while the mean and SD on 50m dash, Standing Broad Jump, Shuttle run and 600m Run & Walk tests computing against standard score (criterion-referenced standard) were found 50.02 ± 9.95 ; 50.14 ± 9.99 ; 49.95 ± 9.94 and 50.05 ± 9.97 respectively.

Figure 1
GRAPHICAL REPRESENTATION OF SELECTED PARAMETERS ON OBTAINED SCORE, NORM-REFERENCED AND CRITERION-REFERENCED SCORES



OS=obtained score;

NRS=norm-referenced score; CRS=criterion-referenced score.

The Mean value and Standard deviation of Physical Fitness by criterion-referenced and norm-referenced evaluation of subjects have been presented in Table 2.

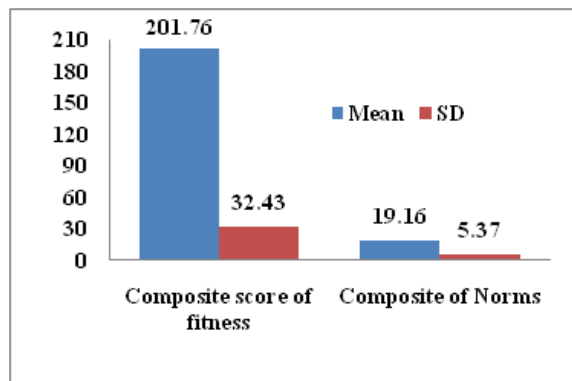
Table 2
THE MEAN AND STANDARD DEVIATION OF CRITERION-REFERENCED AND NORM-REFERENCED COMPOSITE FITNESS SCORES

	Criterion-referenced score	Norm-referenced score
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Mean	201.76	19.16
SD	32.43	5.37

Table 2 shows that the mean value and standard deviation of physical fitness composite scores measured by two different evaluation systems were found 201.76 ± 32.43 (criterion-referenced) and 19.16 ± 5.37 (norm-referenced) respectively.

Figure 4
GRAPHICAL REPRESENTATION OF CRITERION-REFERENCED AND NORM-REFERENCED COMPOSITE FITNESS SCORES



The values of Coefficient of correlation between Norm-referenced and Criterion-referenced standard scores on selected physical fitness components of subjects were presented in Table 3.

Table 3
NORM-REFERENCED AND CRITERION-REFERENCED STANDARD SCORES ON PHYSICAL FITNESS

Sl. No.	Parameters	Coefficient of Correlation
1	Norm-referenced Standard scores	0.995*
2	Criterion-referenced Standard scores	

*Significant at 0.05 level,

$r_{0.05}(123) = 0.174$

Table 3 revealed that the physical fitness scores computed by norm-referenced standards and criterion-referenced standard were highly significant as obtained r-value was 0.995 against tabulated value of 0.174 setting the level of significance at 0.05.

Results and Conclusion:

The findings of the study revealed the fact that physical fitness scores assessed by criterion-referenced standards are of equal importance as estimated from the norm-referenced standards. Usually, norm-referenced standard is accepted and used by physical educators to evaluate the fitness level of students in a group. Therefore, the study may significantly generate the message of using criterion-referenced standard against students' physical fitness score

- to avoid the fraction of error produced out of conversion of raw scores to norm-referenced standard;
- to avoid negative impact of scoring where less the score designate data performance in a component;
- to rank the students scientifically while norms of certain populations are not available.

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