



CONSTRUCTION OF SPECIFIC PHYSICAL FITNESS TEST FOR BOWLERS

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Abstract:- In order to construct a scientifically designed to assess the specific physical fitness test battery for bowlers, this paper aim to construct the Specific Physical Fitness Test of Bowlers in Cricket. A 16 experimental test items purported to measure Speed, Strength, Endurance, Agility, Flexibility, coordination and Balance were Administered to 25 Players of North-Zone level intervarsity cricket players. The age ranged from between 18 to 25 years of age. The collected data was subjected to factor analysis (SPSS VERSION 17.0). The factor matrix was extracted to have rotated factor loadings. By considering the administrative feasibility, logistic interpretation with respect to the relevant field of application, rotated factor loadings and communality a test battery of four test items to measure the specific physical fitness test for bowlers of North- Zone level cricket players.

Keywords:Factor Analysis, Factor loading, Construction, Specific Physical Fitness.

INTRODUCTION

Today's sports have different forms in the sense that earlier, more emphasis was laid on creative aspects, competition was become the defining feature of sports in modern society. Even though cricket is one of the oldest organized sports, there are very few studies on the physical demands of the game (Woolmer & Noakes, 2008) Actually, the cricketers are exposed to more demanding schedules, with longer period of time for training and practicing (Davies, 2008). Basically, cricket is a popular team game in most Commonwealth countries. In past it was played solely in a specific season (in Asian countries it was winter and in western countries it was summer). But its popularity has gained tremendous momentum since last three decades and now it is played throughout the year. Cricket is an endurance game and requires potential physical-physiological ability to excel the performance. Cricketers are therefore exposed to more demanding schedules, with longer periods of training and practicing. The increased workload may be one of the contributing factors to the increased incidence of injuries (Davies, 2008).

The importance of Specific fitness involves focusing the fitness goals of an athlete to meet the specific needs of an activity. An awareness of specific fitness cans workout to their performance in their sport. The performance potential of a cricketer player can be improved by specific fitness training which is generally divided up into aerobic, anaerobic and specific muscle training. Sport-specific strength training programs are fundamental to an athlete's development and success. The requirements of fitness are highly specific to sports for example a bowling in cricket player needs different type of fitness than batting etc. Fitness involves focusing the fitness goals of an athlete to meet the specific need of an activity. The term is most common when referring to athletes who play a particular sport; the athletes identify the specific physical requirements of that sport and then target exercises that will increase their fitness in those areas. An awareness of specific fitness can help athletes excel in their chosen sports because it directly connects their workouts to their performance in their sport. The development specific fitness requires the appropriate level or amount of motor abilities in relation to the requirement of the game concerned have also to be kept in view. And (Henson, 1987) also opined that the training is affected by the specificity and so, it must be specific to the requirements of the event.

The fitness of a cricketer which is specific to the game has no utility for the fitness of other game. Here the

concern of researcher is specific fitness, particularly bowling for the game of cricket. Cricket fitness training is a form of sport-specific training designed for cricket players. The top cricket players in the world use fitness plans to developed and adapted for their needs by their coaches. Players need to be capable of high intensity bursts of energy, but they also need the endurance to make it all the way through a match. Muscular strength, speed, Coordination, flexibility, and agility are also important as cricket players. Harre (1979) for achieving a higher level of efficiency in technique and tactics in most of the sports, a high level of specific fitness is more important, because a Specific fitness is the key point of success for sportsman in the higher level competitions.

Although every player of the team is required to bat and field during the match, generally, each player possesses specific physical fitness, skills that defines their role and contributes to overall performance of the game (Stuelckenet, 2007). In respect of research on the physiological demands of bowling is sparse with the only studies available being those which included some physiological measures when assessing other aspects of the game. One study has found that heart rates of between 154 and 158 bt./min during a 6-over fast bowling spell (Devlin, 2000). This was confirmed by Taliép, (2003) who found that heart rates during fast bowling ranged between 73% and 77% HR max. (Burnett ,1996) reported peak heart rates of between 180 and 190 bt./min during a 12-over fast bowling spell,(Noakes & Durandt, 2000). It is common in cricket for a fast bowler to experience a series of collisions with the ground in the run-up which are followed by a large impact at rear- and front- foot landing on the pitch during the delivery stride. The major impact with the pitch at front foot strike generates peak forces of approximately five times body weight vertically and two times body weight horizontally irrespective of the standard of performance (Elliott, 2000). So, adequate energy level must be maintained. With respect to bowling, although most of the research has focused on lower back injuries (Stretch, 2000), it is the view of (Noakes & Durandt, 2000), that the repeated eccentric actions during fast bowling are the real source of stress for fast bowlers and that this needs to be followed up and related to speed and accuracy of bowling as well as injury potential. Substantial specific fitness and muscle strength is required to reduce muscle damage arising from these repeated actions (Thomps, 1999). In playing positions such as bowling, a great amount of strength of the back muscles is required. Mechanical factors play an important role in the etiology of degenerative processes and injuries to the lumbar spine. Especially in fast bowling, where a player must absorb vertical and horizontal components of the ground reaction force that are approximately five and two times body weight at front-foot and rear-foot impact respectively, thus, assessment of back strength is essential (Elliott, 2000). The maximum capacity of the back muscles must be known and subsequently muscle endurance, if assessments are to be made of muscle fatigue during playing conditions (Mannion, 1999). However, the anatomical and biomechanical structures of the back are extremely complex and consequently, accurately measuring back muscle strength is problematic outside of a research setting. Further, the increased demands being placed on many cricketers now provide further need for them to be in peak physical condition not only for performance, but also for prevention of injury (Noakes & Durandt, 2000).

Here the concern of researcher is construction of specific physical fitness, particularly for the bowlers, game of cricket. The top cricket players in the world use fitness plans to developed and customized for their needs by their coaches. And other people can consult with personal trainers and cricket coaches to get advice on creating a cricket fitness training program, provide information and assistance with fitness training, including recommended workout schedules that people can use as a basis for the program. Cricket is a physically demanding sport. Players need to be capable of high intensity bursts of energy, but they also need the endurance to make it all the way through a match. At the elite level, sides like Australia and England are now extremely fit utilizing various fitness techniques to enhance the athletic abilities of their squads. There are a range of physical and mental factors that contribute to successful performance in sports. Cricket is basically a 'skills' game. A player has to be fit enough to perform a given job on the field without getting tired. Cricket fitness training is a form of sport-specific training designed for cricket players. Cricket is a physically demanding sport. Players need to be capable of high intensity bursts of energy, but they also need the endurance to make it all the way through a match. Coordination, flexibility, and agility are also important as cricket players. People who play cricket professionally and who want to develop their amateur games need fitness training to be able to take their performance to the next level. Getting too focused on one area of fitness can limit the athlete's versatility within his /her sport because most sports require a variety of skills. Another problem that can arise as a result of sport- or task-oriented fitness is that the athlete can create unnatural imbalances in his /her fitness that can eventually have health repercussions. It is also important for athletes to remember achieving their specific fitness goals. Physical fitness describes the functional capacity of the individual for the task (Messmer, 2014).

To meet the specific need of an activity an athlete requires focusing on fitness goals. It refers to those athletes who involve in a particular sport. Such types of athlete identify their specific exercise requirement and then select exercises to increase their fitness in specific areas. Such type of selected exercises helps directly to enhance performance of athlete in their selected sports. When athlete concentrates only on specific fitness, it may hamper general fitness, so athlete should know about exercises as well. The nature of the position requires that a bowler has the ability to move explosively in the run up to delivery, as a speedy run up will physically translate into a faster delivery of the ball; the arm, shoulder, and core body strength and stamina are necessary to deliver the ball repeatedly.

The above mentioned literature emphasized the growing need of construction of specific physical fitness for bowlers. As the investigator interested in developing a specific physical fitness test battery. It becomes mandatory to explore the existing knowledge regarding the cricketer's specific physical fitness.

METHODOLOGY

Selection of the subjects

The subjects for the study were 25 intervarsity cricket players specialized in bowlers. The chronological age of the players was between 18 to 25 years. They were recruited randomly from various universities participated in North-zone intervarsity cricket tournament held at Aligarh Muslim University, Aligarh. No grouping of players was made during this phase. The sample for the construction phase was 25 players exposed to sixteen different fitness items. Then after taking data, all the skills were raised through factorial analysis.

SELECTION OF TEST ITEMS

In order to select the broad component of test, the available literature of physical fitness were critically reviewed and opinions of experts regarding these tests obtained. Also existing literature on the appropriate component of physical fitness in Indian geographical condition/ situation were considered. All the components of the physical fitness were considered. On the basis of these the following components for the specific physical fitness test for cricketer are considered. The physical fitness components are: Strength, Endurance, Agility, Flexibility, Coordination and Balance.

EXPERIMENTAL TEST ITEMS:

During the process of selection of the components of specific fitness test, the test items for each components were also identified along with and 16 test items were considered as: Standing broad Jump, Sit- ups, Dips, Pull- ups, Zig-zag, Shuttle run, 50 yard dash, Side-stepping, Squat Thrust, 600mts run/walk, Criss-cross, Skipping, Stroke Stand, Trunk lift, Sit and reach, and Hand Reaction.

METHOD OF EXECUTION:

Each experimental test items administration was adhered strictly administration procedure outline and protocol.

STATISTICAL TECHNIQUE:

The results have been obtained through the statistical package social sciences SPSS version 17.0. The Pearson product moment correlation formula has been utilizing for correlation of variables and the matrix of inter correlation among the sixteen variables was obtained. The data was then being factor analysis. The principal component analysis was used to extract factors. Varimax rotation (Kaiser's normalization) was used to generate rotated factor matrix. After that the rotated factor matrix was used to the selected factor for analysis of data.

RESULT AND DISCUSSION

In this study of development of specific fitness test for the bowlers in the sports of cricket. The obtained data was analyzed by the statistical procedure of Factorial analysis. The factorial analysis was done by SPSS version 17.0

Table -1: Descriptive analysis of 16 fitness test items

S.No.	Test variables	Catalogue	Mean	S.D
1	Standing broad Jump	Test item-1	2.624	0.237
2	Sit- ups	Test item-2	47.960	8.942
3	Dips	Test item-3	53.200	6.745
4	Pull- ups	Test item-4	11.120	3.745
5	Zig-zag-running	Test item-5	9.220	0.066
6	Shuttle run	Test item-6	10.199	0.331
7	50 yard dash	Test item-7	6.324	0.418
8	Side-stepping	Test item-8	16.880	1.986
9	Squat Thrust	Test item-9	9.800	1.893
10	600mts run/walk	Test item-10	1.420	0.085
11	Criss-cross	Test item-11	10.680	2.626
12	Skipping	Test item-12	56.200	7.511
13	Stroke Stand	Test item-13	14.403	2.146
14	Trunk lift	Test item-14	32.525	3.128
15	Sit and reach	Test item-15	9.916	4.347
16	Hand Reaction	Test item-16	29.320	8.924

In this study Table 1 displays the descriptive statistics analysis i.e.: mean and SD of the selected Sixteen test items which were administered on the bowlers who played as subject in this study for obtaining the data.

The mean of standing broad jump test item number-1 is 2.624 and SD is 0.237. The mean of sit-ups test item number-2 is 47.960 and SD is 8.942. The mean of Dips test item number is-3 is 53.200 and SD is 6.745. The mean of pull-ups test item number-4 is 11.120 and SD is 3.745. The mean of zig-zag test item number-5 is 9.220 and SD is 0.066. The mean of Shuttle run test item number-6 is 10.199 and SD is 0.331. The mean of 50 yard dash test item number-7 is 6.324 and SD is 0.418. The mean of Side stepping test item number-8 is 16.880 and SD is 1.986. The mean of Squat Thrust test item number-9 is 9.800 and SD is 1.893. The mean of 600mts run/walk test item number-10 is 1.420 and SD is 0.085. The mean of Criss-cross test item number-11 is 10.680 and SD is 2.626. The mean of Skipping test item number-12 is 56.200 and SD is 7.511. The mean of Stroke Stand test item number-13 is 14.403 and SD is 2.146. The mean of Trunk lift test item number-14 is 32.525 and SD is 3.128. The mean of Sit and reach Test items-15 is 9.916 and SD is 4.347. The mean of Hand Reaction Test items-16 is 29.320 and SD is 8.924.

Factor Analysis: The purpose of factor analysis is to “explore the under lying variance structure of a set of correlation coefficient. Thus, factor analysis useful for exploring and verifying patterns in a set of correlation coefficient” (Brown, 2001).

Table-2: Representing Factor Loading of factor I

S.No.	Test Variables	Catalogue	Factor loading
1	Dips	Test item-3	0.974
2	Pull-ups	Test item-4	0.954
3	Side stepping	Test item-8	0.965
4	Criss cross	Test item-11	0.517
5	Skipping	Test item-12	0.965
6	Stroke stand	Test item-13	0.940
7	Sit and reach	Test item-15	0.977

Factor I (Table 2):- The factor I is defined by test which can measure flexibility. The highest factor loading is 0.977 to sit and reach is used to measure of the lower back and hamstring muscles. Pull-ups and dips are used to measure shoulder upper arm strength and upper body strength is very important for fast bowlers in the game of cricket. A side stepping this test item has greater affinity toward sprinting speed. Stroke stand measures body balance of the body. Which is criss cross test can improve agility for rapid and accurate directional change in play.

Fig.1: Representing the highest factor loading of Factor I

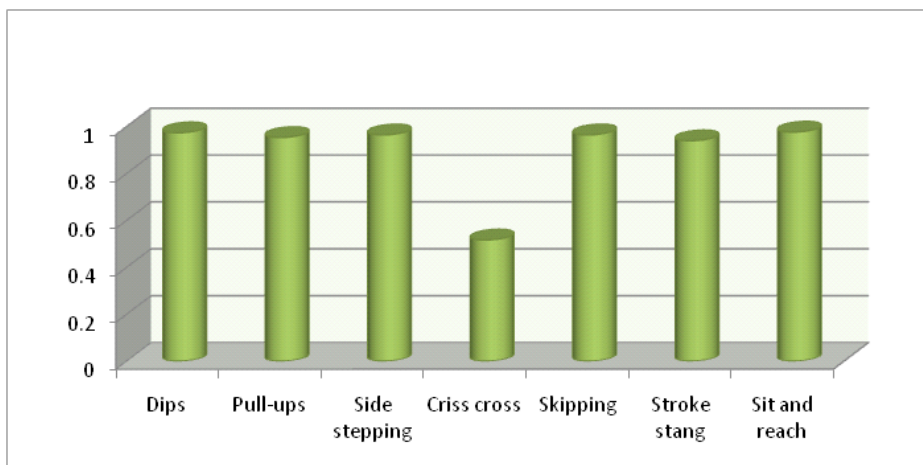


Table-3: Representing Factor Loading of factor II

S.No.	Test Variables	Catalogue	Factor loading
1	Standing broad jump	Test item-1	0.717
2	Sit-ups	Test item-2	0.843

Factor II (Table 2):- These two items were identified in different components of physical fitness i.e. Which is sit-ups is exhibit significance positive factor loading is 0.843. basically sit-up test primarily measures abdominal and hip-flexor muscles, strength and endurance training exercise. It is the basic exercise used by cricketer’s fitness training. It plays a significant role for the core stability and back support. Whereas standing broad jump to measure the identified/emphasized on the ability to exert maximum explosive energy on maximum effort.

Fig. 2: Representing the highest factor loading of Factor II

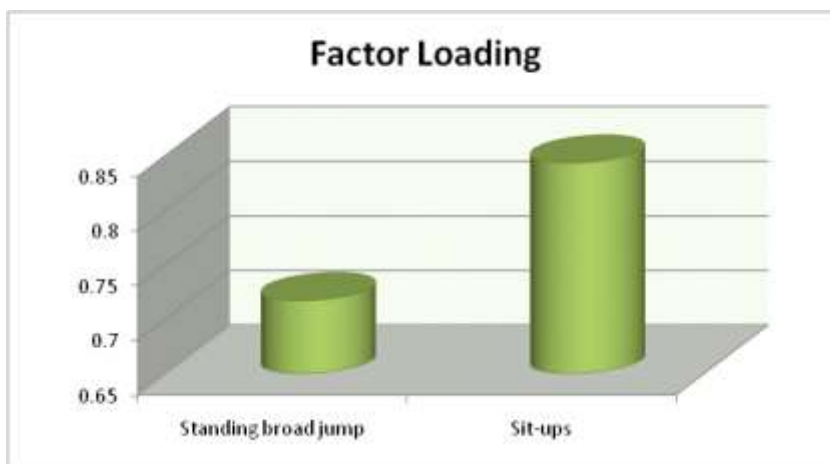


Table-4: Representing Factor Loading of factor III

S.No.	Test Variables	Catalogue	Factor loading
1	Zig zag	Test item-5	0.915
2	Shuttle run	Test item-6	0.172
3	600mts run/walk	Test item-10	0.185
4	Trunk lift	Test item-14	0.166
5	Hand reaction	Test item-16	0.120

Factor III (Table 4):- The highest factor loading Zig-zag running is 0.915 appears to be primarily a reaction ability and measure of coordination movement and speed which is very important workout of the cricket players. 600run/walk to determine measure of cardiovascular fitness, it also a important factor for cricketers .Hand reaction test is the true factor emphasis on the ability to react faster and faster, that's why trunk lift shown the flexibility which is determine the agility of the players.

Fig.3: Representing the highest factor loading of Factor III

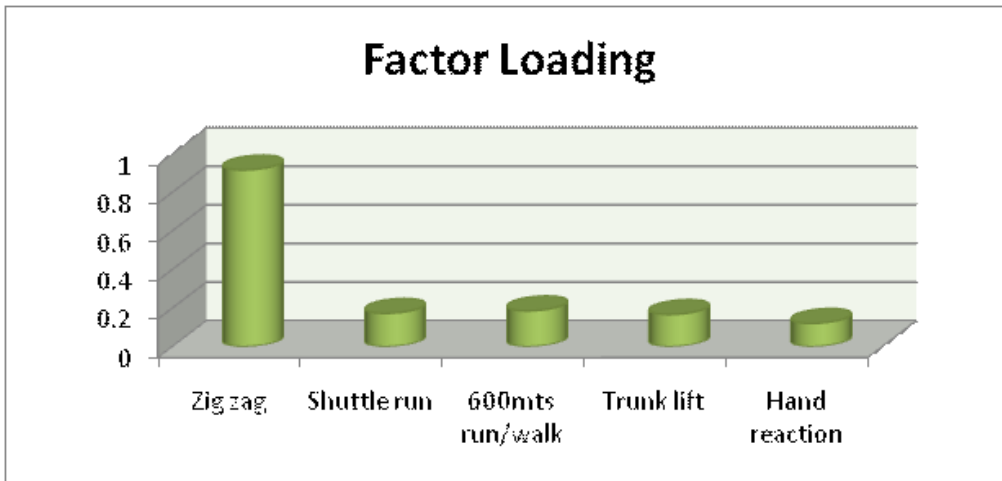


Table-5 Representing Factor Loading of factor IV

S.No.	Test Variables	Catalogue	Factor loading
1	Squat thrust	Test item-9	0.924

Factor IV (Table 5):- Only squat thrust came significant loading of factor IV is 0.924. This test item describes the quality of explosive strength with the individuals and has a great importance for improving fitness level of cricket players.

Fig.4: Representing the highest factor loading of Factor IV

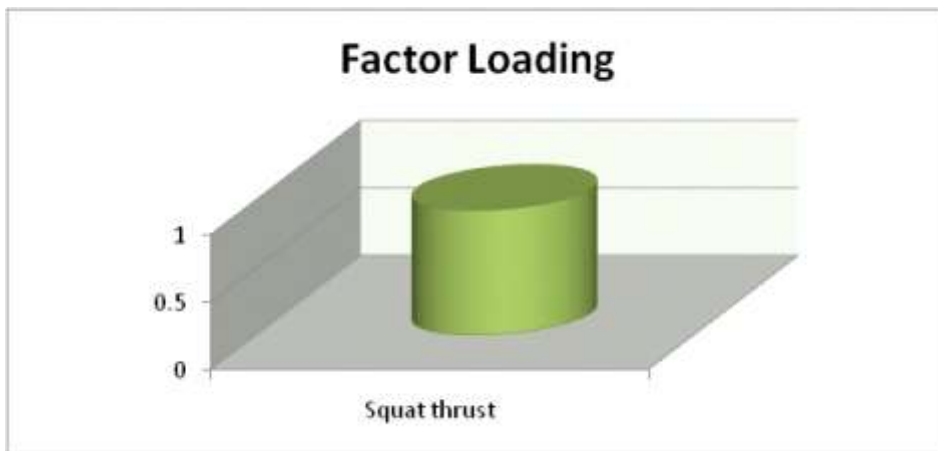


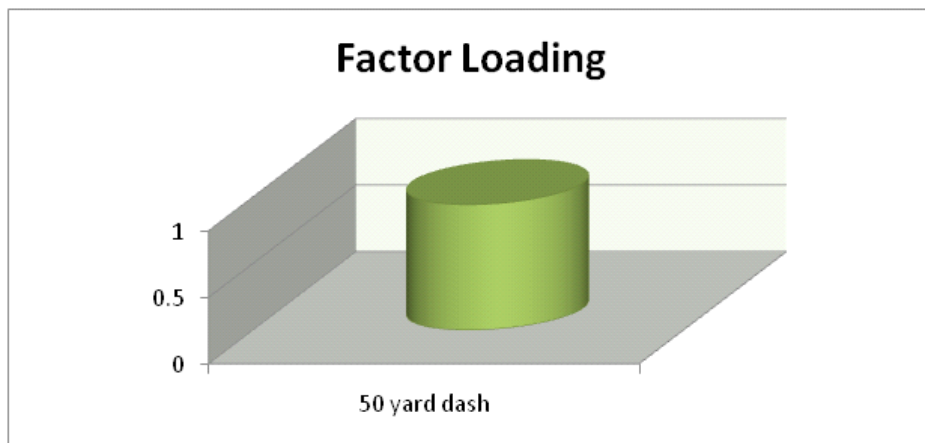
Table-6 Representing Factor Loading of factor V

S.No.	Test Variables	Catalogue	Factor loading
1	50 yard dash	Test item-7	0.943

Factor V (Table 6):- The single factor 50 yard dash came significant loading in factor V is (0.943). Speed the

rate of change of successive movement of the same pattern.

Fig.5: Representing the highest factor loading of Factor V



DEVELOPMENT OF THE TEST BATTERY.

The bringing together several tests, which turn out to measure the same factor, is not very efficient. According to Fleishman (1964) inefficient test batteries are those with too many tests on one factor and none from one or more of the factors identified. The test items were selected to be included in the test on the basis of results obtained from the factor analysis to serve as the criteria to measure the specific physical fitness test for bowlers in cricket. Considering the administrative feasibility logistic and educational application following specific physical fitness test recommended for the north- zone level cricketers.

Table -7 Constructed of specific physical test battery for bowler (cricket)

1	Factor -1	Sit and reach	0.977
2	Factor-2	Sit-ups	0.843
3	Factor-3	Zig zag running	0.915
4	Factor-4	Squat thrust	0.924
5	Factor-5	50 yard dash	0.943

CONCLUSIONS

Based on the findings and statistical analysis, critiques and experts deliberation in the light of critical literature and scientific information on the performance demands of construction of specific physical fitness test for bowlers in cricket. Existing knowledge could be completed by obtaining the considered opinions and insides of coaches and players. This information would also provide a framework for the development of specific physical components of bowling as specific assessment, focused on systematic training, conditioning, coaching and training protocols.

In the light of result the conclusions were drawn as the Factor analysis Rotated Varimax solution significantly and appropriately identified the test items for the construction a specific physical fitness test for bowler for North - Zone level cricket players. Every sport differs from one to another and also the demand of specific physical fitness ability in various games and sports. A bowlers differs from batsman and fielders etc in a quality and quantity of fitness components like balance, reaction ability (sharp movement ability to change position immediately). The test items derived indisputably represent the specific physical fitness components for bowler.

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