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Analysis of Arm and Shoulder Girdle Strength and Agility of College-Level Male Baseball Pitchers and Non-Pitchers

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Abstract

The purpose of the present study was to compare the arm and shoulder girdle strength and agility of college level male baseball pitchers and non-pitchers. Twenty four randomly selected male baseball players of different colleges affiliated to pondicherry University, puducherry, volunteered to participate in the study. Out of 24 male baseball players 12 were pitchers and 12 were non-pitchers. Medicine ball put test was used to measure the arm and shoulder girdle strength. Where as Illinois Agility Test was used to measure running agility of the subjects. The independent samples t-test reveals that pitchers had significantly greater arm and shoulder girdle strength ($p<0.05$) as compared to non pitchers .In case of agility, there was no significant difference between pitchers and non-pitchers.

Keywords: Strength, Agility, Baseball, Pitchers, Throwing.

Introduction

Many sports performed on a court or on a field require high-speed total body movements. Many of these are in response to the motion of a ball, opposition players, or teammates (Young, 2006). Base ball is physically demanding sport comprised of several specialism requiring different skills and types of fitness. The sport requires excellent eye-to-hand coordination, instantaneous reflexes and the coordinated movements of the hips, shoulders, arms and wrists. The game of baseball entail throwing, fielding, pitching, catching, base running and hitting. Base ball pitching is a complex, highly skilled, repetitive task in which the subjects throwing shoulder to maximal stresses (Cook et al., 1987). The action of over head throwing places significant demands on the shoulder. Therefore, the greater shoulder girdle strength this required for a pitcher in baseball. Strength of the shoulder girdle is also necessary for hitting and throwing the ball. As for strength training, studies have shown that baseball-specific program can significantly increase batting speed and striking power as well as throwing velocity (Szymanski et al., 2006).

Many studies describe upper extremity characteristics of baseball pitcher (Barnes and Tullos, 1978; King et al., 1969; Torg et al.1972; Tullos et al., 1972) and muscle activity of the arm and shoulder girdle during throwing (Jobe et al., 1984).

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Agility is commonly defined as an effective and quick coupling of braking, changing directions and accelerating again while maintaining motor control in either a vertical or horizontal direction (Drabik, 1996; Plisk, 2000; Verstegen and Marcello, 2001). An athlete that displays good agility will most likely possess other qualities such as, dynamic balance, spatial awareness, rhythm, as well as visual processing (Ellis et al., 2000). Agility is necessary to change the direction more quickly and efficiently, it is utilized both in fielding and running basses in the baseball.

The pitcher is in closest proximity to the batted ball on almost every pitch. This situation makes the agility of the pitcher, his ability to react and move a critical aspect of his preparation. Agility plays a role in delivering the pitch, where balance is a key component, but it also becomes critical once the ball is put into play, especially if it is hit in the direction of the pitcher. More agile pitchers are more able to help their team defensively after the pitch is delivered. Power training (through polymeric or ballistics for example) can increase a baseball player's speed and agility. The baseball is mostly played by the males in the western countries, China, Japan, Korea etc. In India, both male and female players play baseball at school level, college level, university level and national level.

A plethora of research work is available on the physical characteristics of baseball players belonging to different nations (Tejedor et al., 1986; Rivera, 1991; Lee et al., 1998; Escamilla et al., 2001; Fleisig et al., 1999; Pugh etal., 2001; Murata, 2001). However, a scant literature is available on the physical characteristics of female baseball players, especially in case of India. The

present study, therefore, compare the shoulder girdle strength and agility of college level female baseball pitchers and non-pitchers and fill up already existing void of literature in Indian concern.

Methods

Twenty-four randomly selected female baseball players of different colleges affiliated to pondicherry University, puducherry, Volunteered to participate in the study. Out of 24 male baseball players 12 were pitchers and 12 were non-pitchers. This test was used to measure the arm and shoulder girdle strength. The test involved throwing a 2 kg medicine ball in the horizontal direction as far as possible. The participant was asked to hold the medicine ball in one hand close to the point, where the shoulder joins the neck and stand between the two restraining line to put the ball down the course. Three trials were given and the best was taken as the score of the test. The distance was measured in meters.

Illinois agility test (Getchell, 1979) was used to measure agility. The test area was marked as shown in Figure 1. The subject was asked to lie on their front (head to the start line) and hands by their shoulders. On the 'Go' command the subject gets up s quickly as possible and runs around the course in the direction indicated without knocking the cones over, to the finish line. Each subject was allowed three trials and the best timing from starting signal to the time when the subject's chest crosses the finish line was taken as the score of the subject.

Values are presented as mean values and SD. Independent samples t test was used to test if population means estimated by two independent samples differed significantly. A significance level of $P<0.0.05$ was considered significantly different. Data was analyzed using SPSS Version 16.0 (Statistical Package for the Social Sciences, version 16.0, SPSS Inc.,

Results

Table 1 shows the demographic characteristics of female baseball players. Table 2 shows the mean values and standard deviations of agility in pitchers and non-pitchers. The mean time in Illinois agility test by the pitchers was 18.72 s. The mean time in agility by the non-pitchers was 18.29 s. A non significant difference in agility was observed among the subjects. The mean values and standard deviations of arm and shoulder girdle strength in pitchers and non pitchers are depicted in Table 3. The mean value of arm and shoulder girdle strength of the pitchers was 6.57m and for the non-pitchers it was 6.03 m. The pitchers were found to have significantly greater arm and shoulder girdle strength ($p<0.05$) as compared to non-pitchers.

Table I. Demographic Characteristics of Female Baseball Players

Variables	Pitchers		Non Pitchers	
	Mean	SD	Mean	SD
Age (Years)	21.38	2.09	22.06	2.62
Playing Experience (Years)	5.41	1.21	5.81	1.74
Weight (kg)	56.50	3.72	55.50	3.30
Height (cm)	161.31	7.32	160.20	7.71

Table- 2. Comparison of Agility between Pitchers and Non-Pitchers

Variable	Group	(N)	Mean	SD	SEM	't' Value
Agility	Non Pitchers	12	18.29	0.93	0.24	0.91
	Pitchers	12	18.72	1.28	0.33	

Table- 3. Comparison of arm and shoulder girdle strength between pitchers and non-pitchers.

Variable	Group	(N)	Mean	SD	SEM	't' Value
Agility	**Non Pitchers**	12	6.03	0.83	0.21	**2.23***
	Pitchers	12	6.57	0.96	0.24	

Discussion on Findings

The findings of the present study revealed that there was a significant difference in arm and shoulder girdle strength of baseball pitchers and non-pitcher players and pitchers showed greater arm and shoulder girdle strength. Lee et al. (1998) reported that baseball players 'physical characteristics differed according to their positions. Pitching is a complex activity integrated and coordinated motion of the entire body and arm and shoulder girdle strength. The overhead throwing motion is used in numerous sports including track football and baseball. Among these sports, the baseball pitch is unique in the demands placed upon the shoulder (Brumitt et al., 2005). Cools et al. (2002) measured unilateral, isokinetic, protraction and retraction strength for a pool of healthy subjects (10 females and 9 males) very similar to our subject pool. Wilk et al. (1999) used a handheld dynamometer to record the isometric shoulder girdle strength of 65 professional baseball players and reported that the pitchers had greater shoulder girdle strength than the non-pitcher players. The results of the present study are also in line of those reported by Wilk et al. (1999). A previous report showed that the flexor angular strength of baseball players was ranked 2nd out of 19 sport events as they recorded 43.7±7.6 kg, and extensor angular strength was ranked 5th out of 20 sport events as they recorded 80.3±12.0 kg indicating that baseball players required a high level of muscular strength (Ko et al.,2002).

The results of the present study indicated that there was no significant difference in case of agility of baseball pitchers and non-pitchers because every player of baseball require fast directional changes in four directions with emphasis on quick lower body movements for better performance during defensive fielding and base running(Lee et al., 1998).

Conclusion

In conclusion, the present study revealed that the pitchers had significantly greater arm and shoulder girdle strength than the non-pitcher players where as no significant difference was found in case of agility of baseball pitchers and non-pitcher players. Whether the observed study patterns apply to other population groups such as the elderly, impaired, or specially others games trained athletes remains a question for future study.

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