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A comparative study of standing broad jump performance between professional and amateur medium-fast bowlers of Indore

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Abstract
A comparative study between professional and amateur medium-fast bowlers was conducted to assess the difference between the standing broad jump Performance of both groups. 40 male participants of the age group 16-19 were selected for the study. SBJ (standing broad jump) was considered the dependent variable. The health status and subjects' willingness to participate in the study was considered prior to the test. For the calculations, independent samples t-test was used with a 0.05 level of significance. Data were computed with the help of IBM SPSS 26 software. The mean performance of professional medium-fast bowlers was found to be 2.26 whereas it was 2.16 for the amateur medium-fast bowlers. On the 0.05 level of significance, the null hypothesis failed to be rejected at obtained t-value = –0.458. It was concluded that there was no statistically significant difference between both groups. Further recommendations were made for future studies.

Keywords: Medium-fast, professional bowlers, amateur bowlers, cricket, standing broad jump

Introduction
Despite the widespread popularity of cricket worldwide and the abundance of research on the biomechanical and physiological causes of back problems, there is little data available on the anthropometric and physical fitness factors that affect fast bowling efficiency (Dennis *et al*., 2003; Elliott, 2000; Stretch, 2003) [3, 4, 11]. At all levels of the game, coaches are being influenced by the growing professionalism in preparing players for the physical demands of both test and one-day cricket. A review of the available literature on cricket came to the conclusion that considerably more study was necessary before the scientific foundations of the game could be fully understood (Bartlett, 2003; Krishna *et al*., 2019) [1, 7]. It is obvious that additional cross-sectional, longitudinal, and intervention research are needed to explore how well players are physically prepared for the demands of modern international cricket (Pyne *et al*., 2006) [9]. The fast-bowling motion consists of a run-up phase, a leap phase, and a landing phase on the lower limbs, when strong ground reaction forces are produced, especially at the front limb. The release of the ball comes next. Large ground reaction forces are a known risk factor for lumbar spine injury when not sufficiently dissipated (Elliott *et al*., 1992; Foster *et al*., 1989) [5, 6]. To absorb these high-impact forces with knee flexion and then extend immediately before releasing the ball to maximise efficiency and ball speed, good dynamic knee strength is necessary (Hadzic *et al*., 2010) [7]. To assess knee strength, Standing Broad Jump (or in some native places, Standing Long Jump) test was used as it is a reliable measure to asses lower body strength (Castro-Piñero *et al*., 2010) [2].
The research question was to check whether the standing broad jump differs between the level of medium-fast bowlers. Hence, this study tried to assess whether the SBJ performance differs between professional medium-fast bowlers and amateur medium-fast bowlers.

Research Methodology
40 male medium-fast bowlers from the Maharaja Yeshwantrao Cricket Club in Indore were chosen for the study based on purposive sampling. They were divided into two groups consisting of 20 bowlers each.

Out of 40 bowlers, 20 represented Indore Division Cricket Association in U-16 and U-19 age groups and they were categorized as professional bowlers, while the other 20 bowlers did not possess professional cricket experience at the time of data collection hence, they were categorized as amateur bowlers, y*et al*l of the participants were active athletes. All of the bowlers had at least two years of playing experience. Participants ranged in age from 16 to 19. The study's objective was to compare SBJ performance between professional and amateur medium-fast bowlers. Prior to the test, it was ensured that each individual was in good physical condition and that they were all willing participants.

Test administration

The test was carried out on a grassy cricket ground from 07:00 AM to 07:45 AM IST on a moderately sunny morning. During the test, the temperature range of the area, 27 to 28 degrees Celsius was recorded. The participants were instructed for a 5-minute warm-up that included jumping jacks, light running, and muscular stretches. In order to help the leg's external mechanical work during the propulsive phase of the maximum standing vertical and wide jump, the stretching exercises concentrated on the muscles that cross the ankle, knee, and hip joints (Robertson & Fleming, 1987) [10]. An area of 3 x 5 meter was marked for the SBJ test. Prior to the test, the subjects were instructed about the protocol and nature of the test. The subjects were given three trials each for the jump, and the best of three trials was considered for the statistical analysis. The information was manually entered and written down on paper sheets. The scores of the foul attempt were not recorded. No subject performed all three foul attempts as at least one of the three jumps was legal. The subjects were asked for the cooling-down exercises after the test was over.

Statistical Techniques

To compare SBJ performance of amateur and professional bowlers, an independent samples t-test with a significance level of 0.05 was used as the statistical method. The results were computed using IBM SPSS 26.

Table 1: SBJ performance of professional and amateur bowlers

SBJ performance	
Professional	**Amateur**
2.37	2.60
1.89	2.15
2.05	2.32
2.68	1.95
2.71	2.35
2.26	2.21
2.09	2.06
2.45	1.86
2.19	2.24
1.98	2.41

Analysis of data

SBJ data was evaluated to see if there was any difference between amateur bowlers and professional bowlers' readings. The mean and standard deviation of the descriptive statistics were computed. Additionally, the significance of the difference between amateur bowlers and professional bowlers' data was examined using the independent samples t-test.

Table 2: Descriptive statistics

Group Statistics					
	Type of Bowler	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Standing Broad Jump Performance	Amateur	10	2.2150	.22127	.06997
	Professional	10	2.2670	.28281	.08943

In above table, a descriptive statistical study of SBJ performance readings between amateur and professional bowlers is presented.

Table 3: T-test statistics

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Standing Broad Jump Performance	Equal variances assumed	.899	.356	-.458	18	.652	-.05200	.11355	-.29056	.18656
	Equal variances not assumed			-.458	17.015	.653	-.05200	.11355	-.29156	.18756

In above table, the t-test results that distinguish between SBJ performance of amateur bowlers and professional bowlers are presented.

Discussion of findings

The values of mean, SD, and standard error of mean for the participants are given in Table 2. The mean flexibility of professional bowlers is larger than that of amateur bowlers. However, whether this difference is significant or not had to be tested by using the independent samples t-test for unrelated groups.

One of the conditions for using the independent samples t-test for different groups is that the variance of the two groups must be equal. To test the equality of variances, Levene's test has been used. In Table 3, F value is 0.899, which is non-significant, as the p value is 0.356, which is more than 0.05. Thus, the null hypothesis of equality of variances may be retained, and it is concluded that the variances of the two groups were equal.

It could be seen from Table 3 that the value of t-statistic was –0.458. This t value was insignificant as the p value associated with it was 0.05200, which was greater than 0.05. Thus, the null hypothesis of equality of population means of two groups was failed to be rejected, and it may be concluded that the SBJ performance of amateur bowlers and professional bowlers was not statistically different.

It was desired to test the hypothesis as to whether the SBJ performance of professional bowlers was higher than that of amateur bowlers or not, hence one tailed test was used. The hypotheses were as follows:

$H_0 : \mu_{professional} = \mu_{amateur}$

$H_1 : \mu_{professional} > \mu_{amateur}$

In using one-tailed test, the value of t (= –0.458) was to be compared with tabulated $t_{0.05}$ ($n_1 + n_2 – 2$). Here $n_1 = n_2 = 20$ and, therefore, from critical value of 't' table for one- tailed hypothesis, the value of $t_{0.05}(18) = 2.101$. Since calculated value of t (= –0.458) is less than tabulated t (= 2.101), H_0 may be failed to reject, and it may be concluded that there is no statistically significant difference between the SBJ performances between amateur bowlers and professional bowlers.

Conclusions

Since there may be many factors for such result, one of them may be the lifestyle of the participants other than their cricket life. It is possible that off-the-field lifestyles of both amateur and professional bowlers does not differ much and hence the reason for the statistical insignificance of SBJ performance remains justified.

The study would benefit from better experimental circumstances and a more controlled control of the extraneous variables in order to achieve a more accurate measurement of the standing broad jump performance. Given that only male medium-fast bowlers served as the study's subjects, it is possible to carry out similar research on female medium-fast bowlers as well. Similar study can also be done for temperature ranges that are different, such as in the winter. Although indoor conditions can also be taken into account, this investigation was conducted outdoors. Athletes from various age groups can also be studied. Sportspersons from different games can also be studied upon.

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