Correlation Between Upper Body Balance, Muscle Strength, and Power in Cricketers Belonging to Different Age Groups

Deepika Singla, MPT, M. Ejaz Hussain, PhD, and Pooja Bhati, MPT

Abstract

Objective: The purpose of this study was to assess correlation between variables of upper body balance, muscular strength, and power in cricketers belonging to different age groups.

Methods: Forty-eight healthy male cricketers (26 adolescents aged 14-17 years and 22 adults aged 18-25 years) were recruited from Jamia Millia Islamia, New Delhi, India. After a warm-up, the participants underwent Upper Quarter Y Balance Test, backward overhead medicine ball throw test, and back-strength testing in a random order.

Results: Values of the Pearson correlation coefficient for muscle strength and upper body power were found to be 0.397 and 0.499 for adolescent and adult cricketers, respectively. Correlation coefficient values for upper body balance and strength range from -0.008 to 0.05 and 0.325 to 0.414 and for upper body balance and power range from 0.059 to 0.062 and 0.133 to 0.153 for adolescent and adult cricketers, respectively.

Conclusion: Statistically significant, moderate-sized correlations were demonstrated between muscular strength and upper body power in adolescent and adult cricketers. However, no correlations existed between upper body balance and power and upper body balance and muscular strength in these athletes. (J Chiropr Med 2018;xx:1-7)

Key Indexing Terms: *Sports; Postural Balance; Association*

Introduction

Cricketing activities involve various overhead throwing motions.[1] Repetitive cricketing activities place substantial loads on the throwing arm, which can lead to upper body injuries.[1-3] These injuries might affect performance in competitions and may lead to missed training sessions as well.[4] Balance, strength, and power are extremely important parameters for performance enhancement and prevention of injuries in sports persons. Findings on correlations between parameters of balance, strength, and power have been of particular interest in sports because it may provide rationales for assessment of injury risk and also for developing programs for preventing and rehabilitating injuries.[4]

Association between these 3 performance parameters has been assessed previously in many research studies[2,5-9]; however, these studies are predominantly lower-body specific. Only 1 study[2] focusing on upper body performance could be found, in which correlations between isokinetic upper limb strength and upper extremity power were shown in a population of overhead athletes. Muehlbauer et al[5] investigated the relationship between variables of static balance, dynamic balance, isometric strength, and power in healthy young adults and found a significant association between isometric strength of plantar flexors and power. Explosive force production (power), measured by the performances in maximal vertical squat jump and standing long jump, correlated well with the variables of balance test in middle age and elderly men in a study conducted by Izquierdo et al,[9] who aimed to examine age-related changes in relationships between variables of balance and force production in men of different age groups. A significant positive correlation between isometric strength and muscle power of the lower extremities has also been reported in physically active older adults.[8] There is paucity in the literature regarding whether any relationship exists between the neuromuscular capabilities of upper body balance, muscle strength, and power in cricketers.

Many morphologic and neurologic changes occur during the process of growth and maturation. The maturational process contributes to significant differences in the onset, magnitude, and rate of change of various biological components across athletes of different ages. Moreover, the maturity status also attributes to changes in physiology with age. Because adaptations are dependent on the maturity status, correlations between upper body balance,

Centre for Physiotherapy and Rehabilitation Sciences, Jamia Millia Islamia, Jamia Nagar, Okhla, Delhi, India.

Corresponding author: Deepika Singla, PT, Centre for Physiotherapy and Rehabilitation Sciences, Jamia Millia Islamia, Jamia Nagar, Okhla, Delhi 110025, India. Tel.: +91 8586976427. (e-mail: *dpkasingla@gmail.com*).

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strength, and power should also be age specific so that individualized prevention and rehabilitation programs can be tailored based on age.[6] A study[6] examined the relationship of balance with maximal isometric back strength and lower extremity muscle power measures based on maturity status in soccer players aged 10 to 18 years. Results of this study clearly suggested significant positive correlations among balance and strength and power measures, which were increasing with maturity.

Adolescence is a phase of the maturation process marked by dynamic change in physiological capabilities, physical parameters, sexual characteristics, and social interaction.[10] It is during adolescence that most of the talent identification takes place for early selection of talented individuals into the sports.[10,11] It is important to investigate if adolescents, who have not yet attained adulthood, demonstrate poor, similar, or better performance than their adult counterparts. The authors hypothesize that significant correlations between measures of upper body balance, muscle strength, and power exists in cricketers. Information regarding the relationship of these 3 performance variables may help understand the role of age in determining the efficacy of different training regimes, and also it can help in developing injury prevention and rehabilitation programs. The aim of this study is to determine the correlation between variables of upper body balance, muscle strength, and power in cricketers belonging to different age groups.

Methods

Design

A cross-sectional study design was chosen to investigate the associations between 3 variables: upper body balance, muscle strength, and power. Data collection per participant was conducted on a single occasion between the months of September 2016 and March 2017.

Participants

Cricket players were recruited from school teams and the university team of Jamia Millia Islamia, New Delhi, India. This study was approved by the Jamia Millia Islamia Ethical Committee. Players who reported any injury, fatigue, pain, or history of any surgery during the past 6 months were not included. Twenty-six adolescent (mean age = 16.42 ± .99 years) and 22 adult (mean age = 20.91 ± 1.74 years) players were randomly selected for the present study. Informed written consent was obtained from each player prior to data collection. Participant characteristics have been presented in Table 1 as mean values ± standard deviation.

Procedures

Participants were asked to wear loose and comfortable clothing and adequately hydrate before coming to the laboratory. On the day of testing, they were prohibited from consuming food, beverages, or any known stimuli (eg, caffeine) that would possibly enhance or compromise alertness during the investigation. Each player was instructed and verbally encouraged to give a maximal effort for each performance test. Testing was initiated after a standardized 15-minute warm-up, including whole body stretching exercises, push-ups, and medicine ball throws in different directions. After the warm-up, all participants completed 3 tests in a random order.

Upper Quarter Y Balance Test. This test was used to test upper quarter stability and mobility and, as the name of the test indicates, it challenges the participant's balancing ability. The participant assumed a push-up position, with the feet kept shoulder width apart, to reach in superolateral, medial, and inferolateral directions on a Y balance test kit (Physio Needs Ltd., Dublin, Ireland), using the free hand with maximal effort (Fig 1). The test was performed 3 times and was then repeated on the other hand. Total excursion

Table 1. *Participant Characteristics*

Characteristics	14-17 y (n = 26)	18-25 y (n = 22)	*P* Value	Cohen's d Value	SE	95% CI for Difference	F Value
Age (y)	16.42 ± .99	20.91 ± 1.74	.000[a]	4.5	.401	-5.293 to -3.679	125.124
Height (cm)	170 ± 4	172.89 ± 5.37	.039[a]	0.7	1.353	-5.607 to -.158	4.536
Body mass (kg)	62.76 ± 9.43	69.3 ± 12.13	.041[a]	0.7	3.114	-12.805 to -.267	4.404
DUQYBT score (%)	87.3 ± 7.66	90.52 ± 9.48	.200	0.4	2.5	-8.2 to 1.761	1.693
NDUQYBT score (%)	86 ± 8.4	91.38 ± 8.73	.035[a]	0.6	2.5	-10.364 to -.397	4.724
BOMB score (m)	8.84 ± 1.2	9.8 ± 1.59	.022[a]	0.8	0.4	-1.764 to -.145	5.628
Back strength (kg)	107.9 ± 16.63	104.89 ± 24.13	.612	0.2	5.9	-8.878 to 14.913	.261

BOMB, backward overhead medicine ball; *CI*, confidence interval; *DUQYBT*, dominant Upper Quarter Y Balance Test; *NDUQYBT*, nondominant Upper Quarter Y Balance Test; *SE*, standard error.

[a] Signifies significant difference between 2 groups.