



## ASSOCIATION OF BODY MASS INDEX WITH SPEED, AGILITY AND VO2 MAX OF ELITE KABADDI PLAYERS

### Physiotherapy

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### ABSTRACT

**Background Of Study:** Kabaddi is well known sports usually played in every corner of India as well as some other countries like Pakistan, Iran, South Korea etc. We studied correlation between selected parameters ( Speed, Agility, VO2 max ) and body mass index of elite kabaddi players. **Methodology:** Total 47 kabaddi players aged 18-25 were selected based on inclusion and exclusion criteria from sports authority of India Stadia, Delhi, NCR, India. Every athletes height, weight, BMI, Speed, Agility, VO2max were assessed. Data was analyzed by using pearson's correlation coefficient test. **Results:** There were varying level of correlations have been observed in normal high BMI groups. Normal BMI group shows no correlation with Speed, Agility and VO2 max whereas high BMI group shows positive correlation with agility and VO2 max and negative correlation with Speed. **Conclusion:** We concluded that there is no association of normal BMI with Speed, Agility, VO2max. There is positive association of Speed, Agility and negative association with high BMI group of kabaddi.

### KEYWORDS

Body Mass Index, Speed, Agility, VO2max

#### INTRODUCTION

Kabaddi is a contact team sports originated in old India. It is a national sport of Bangladesh and Iran. Kabaddi is a customary outdoor game played with minor variations in all regions of India and in most part of the Asia. It is a game of speed, strength, agility, flexibility and most importantly lung power. It also requires individual proficiency, quick reflexes, intelligence, strategy and presence of mind of both attackers and defenders as well<sup>[1,2,3]</sup>.

It is played with completely no equipment. It requires playing area with dimensions of 12.5 meters x 10 meters rectangular court (for adults) which further divided by midline into two equal halves (each 6.25 x 10 meters), either indoors or outdoors. Each half is the territory of a team that is one for the raiders and one for the defenders<sup>[4,5]</sup>.

Kabaddi players playing at different positions perform different specific skills during the competition which requires different specified body shape and capacity<sup>[5,6]</sup>.

Body Mass Index is the most common method for obesity evaluation and diagnosis. Based on observations Body Mass index was primarily explained in mid nineteenth that Body Mass is relative to squared height with normal body stature in adult population<sup>[7]</sup>. For adult population it is categorized as low or underweight (< 18.5 kg/m<sup>2</sup>), normal category (18.5-24.9 kg/m<sup>2</sup>), overweight (25-29.5kg/m<sup>2</sup>), obesity (> 30 kg/m<sup>2</sup>)<sup>[8,9]</sup>.

Body Mass Index can be high compare to the fat percentage level because in elite players muscle mass can be more denser than fat that weighs more<sup>[9]</sup>. According to S.K Sabir Ali et al (2014) Kabaddi Players of University level shows Body Mass Index having mean value of 25.45 and with minimum 19.38 to maximum 28.53<sup>[10]</sup>.

Agility is the capability of once to quickly start, stop and change the directions. It has been also recognized it as someone's capability to control and maintain correct body posture whilst changing the direction through a course of movement. This skill is the determinant of sports performance in field and court sports<sup>[11,12]</sup>. It is an important skill for tactical Athletes, Elite and Recreational Athletes who require the capability of changing direction in every plane<sup>[13]</sup>. Agility 't' test is a body control and multi-directional Agility measure that examines the capability of changing track swiftly without loss in balance and decrease in Speed. This is a test that requires very few preparation and apparatus, thus very easy to administer<sup>[14]</sup>.

Sprinting is an essential component necessary for achievements in many team Sports. In many Sports capability of accelerating for shorter distance is the important factor for success<sup>[15,16]</sup>. Athletes never attain maximum Speed throughout the sprinting during so many Sporting activities as in Squash. In actual facts Sprinting occurs most

frequently over a short distance of about to 10 meters from both start positions of standing and rolling<sup>[17]</sup>.

Cardio respiratory fitness is in fact ability of lung, heart and blood vessels to bring the food and oxygen to muscles in a specific time period. Many expert sport scientists have been announced it as a method for evaluating aerobic fitness and as a factor for predicting success of athletes in endurance activities<sup>[18]</sup>.

Vo2 max or maximal oxygen uptake has been internationally accepted method to evaluate cardio-respiratory fitness<sup>[19]</sup>. Queen's and college test is a simple field test to evaluate cardio-respiratory fitness and is applicable in Indian population explored by Chatterjee et al (2003, 2004, and 2005)<sup>[20,21]</sup>. Therefore purpose of current study is to correlate moderate and high BMI of kabaddi players with their speed, agility and VO2max.

#### Methodology

A convenient sample 47 elite kabaddi players with age group of 18-25 falling in normal (33 male) and high (14 male) range those who met the inclusion criteria were recruited from sports authority of India (SAI), Stadia, Delhi NCR. Subjects were agreed to participate voluntarily for study after signing informed consent. To be eligible for inclusion players had to have at least 1 year of playing and training kabaddi, whereas low BMI, recent injury and non kabaddi players were excluded in study.

Measured parameters were Body Mass Index (BMI), speed, agility, VO2 mass. Body Mass Index was calculated as body weight in kilogram (kg) divided by square height in meters (kg/m<sup>2</sup>)<sup>[7]</sup>.

For this a straight 10 meter sprint test was conducted, which involves sprinting 10 m as fast as possible from a stationary start position. Subjects were instructed to begin with their one foot forward, placed on the line marked on the ground from a standing position. The subjects were allowed to perform three test trails. The time recorded in this test was best of the last two trails<sup>[22]</sup>. Time was recorded to nearest one-hundred of a second using electronic stop watch.

Agility was evaluated by using 't' test protocol outlined by Paule et al (2000) with little modification. Instead of ringing bell subjects were instructed to just touch the base of 3 cones (B, C, D). Subjects were begins with both feet behind the starting point A. On their own judgement each subject was sprinted forward 9.14 m (10 yards) to point B and touches the base of cone with right hand. Then they runs sideways to the left 4.57m (5 yards) and touches the base of cone C with left hand. Then subjects shuffled 9.14 m (10 yards) to right and touch the base of cone D with right hand. Then they were shuffled to the left 4.57 m back to point B and touch the base of cone with left hand. Subjects were then run back and crossing the finishing line at point A. Three test trails were performed and time was recorded to nearest one-

hundred of a second using electronic stop watch. For Vo2 max was estimated by using queens and college step test protocol. The test was performed on a step of 41.3 cm (16.25 inch) height with a step rate of 22 steps per minute for females and 24 steps per minute for males for a total of three minutes. Stepping was set by using metronome app. Metronome was set to cadence of 88 beats per minute for females and 96 beats per minute for males. Immediately after stepping for duration of 3 minutes, the recovery pulse rate was measured for a 15 second period and maximum oxygen uptake was calculated<sup>[18]</sup>. Estimation of Vo2 max for male and female was calculated from the test results by using the formulas below (Chatterjee et al 2004 and Chatterjee et al 2005)<sup>[20,21]</sup>.

**For Male** - Vo2 max (ml/kg/min) = 111.33 - 0.42 x heart rate (bpm)

**For Female** - Vo2 max (ml/kg/min) = 65.81 - 0.1847 x heart rate (bpm)

## RESULTS

**Table-1 Demographic Data**

parameters	Mean±SD <sup>2</sup> Normal BMI	Mean±SD <sup>2</sup> High BMI
Age (years)	19.91±2.11	22.36±2.1
Height (cm)	168.91±6.59	167.68±3.83
Weight (kg)	62.89±7.87	74.2±2.58
BMI ( kg/m <sup>2</sup> )	21.99±1.93	26.40±.78
Speed (seconds)	1.88±0.34	1.73±.28
Agility (seconds)	10.32±0.61	10.09±.57
VO2max (ml/kg/minute)	44.59±3.13	40.72±11.01
Pulserate (pulse/minute)	158.90±7.45	162±9.11

**Table-2 Correlation of normal BMI with fitness parameters**

Parameters	Mean±SD <sup>2</sup>	Pearson correlation=r
BMI ( kg/m <sup>2</sup> )	21.99±1.93	
Speed (seconds)	1.88±0.34	.231
Agility (seconds)	10.32±0.61	.146
VO2max (ml/kg/minute)	44.59±3.13	-.029

In Table-2 it shows that speed, agility and VO2 max were not correlating with normal BMI in 33 subjects.

**Table-2 Correlation of High BMI with fitness parameters**

Parameters	Mean±SD <sup>2</sup>	Pearson correlation=r
BMI ( kg/m <sup>2</sup> )	21.99±1.93	
Speed (seconds)	1.73±.28	-.253
Agility (seconds)	10.09±.57	.375
VO2max (ml/kg/minute)	40.72±11.01	.269

In table-3 it shows that agility and VO2max were positively correlating with high BMI whereas speed was negatively correlating with high BMI in 14 subjects.

## DISCUSSION

In our study 47 subjects of trainee professional kabaddi players with experience of one year and above were taken for consideration.

The present study found that there is negative (indirect) relationship of speed with high BMI whereas there is no relationship speed with normal BMI. This finding supports the study of Zou et al (2018), Chen et al (2020) and Wong et al (2009) . Whereas current study slightly differs to study of Dhapola et al (2017), the possible reasons for this could be individuals height, weight, joint range of motion, muscles involved ( slow and fast twitch muscles fibers), type of muscle contractions ( isometric, isotonic, eccentric, concentric etc).

The current study finds direct relationship of agility with high BMI whereas no correlation of agility with normal BMI. This study slightly differs to the report of Hidayat et al (2022), Finds significant relationship between agility and BMI. This could be due to heavier individuals might have more muscle strength and coordination than normal individuals that makes them superior in directional changes.

The current study found direct relationship of VO2 max with high BMI whereas there is no correlation of VO2 max with normal BMI. Current study slightly differs to studies of Shah et al (2016), Simanjuntak et al (2022), Kumar et al (2015) that finds negative ( indirect ) relationship of VO2 max with BMI.

## Limitations

Our study was mainly focused on to assess Body Mass Index and its association with selected parameters among the elite kabaddi players with normal or high BMI, having age group of 18-25 and experience of one or more and availability of smaller sample size.

## Recommendations

Current study is relatively a initiation of scientific call on fitness concerns of elite kabaddi players population of India and world. Study can be further elaborated to find-out the relationship between BMI with parameters of reaction time, visual imagery, side sprints, side reaches, standing reach, double handed grip, bone width and length etc. Bigger sample size and equal ratio of normal and high BMI, Equal ratio of male and female kabaddi players could be a better consideration for future study.

## CONCLUSION

Present study concluded that there is no association of Body Mass Index with speed in normal BMI group of kabaddi players whereas negative association of speed in high BMI group of kabaddi players. There is no association of agility with normal BMI group of kabaddi players whereas there is a positive association of agility with high BMI group of kabaddi players. There is no association of VO2 max with normal BMI group of kabaddi players whereas there is positive association with high BMI group of kabaddi players.

## REFERENCES

- Murthy V., BS (2016), Common Injuries in Kabaddi Play and their Prevention with the help of Biomechanics. International Journal of Physical, Sports and Health, 3 (4) 78-81.
- Ali S.K. S. & Adhikari S., (2012), The Relation between Anxiety and Sports Perfectionism of Kabaddi Players. International Journal of Scientific and Research Publications, 2 (10), 1-4.
- Mahadevswamy B. & Keerthinarayanswamy M. B., (2011), A Comparative Study of Motor Fitness and Sports Achievement Motivation, between Kurukshetra and CCS University Kabaddi Players. International Journal of Jyoti Research Academy, 5 (2), 95-98.
- Dey S., K., Khanna G., L. & Batra M., (1993), Morphological and Physiological Studies on Indian National Kabaddi Players. Br. J Sp Med, 27 (4), 237-242.
- Kumar N., (2016), Anthropometric Characteristic of Kabaddi Players in Relation to Their Playing Positions. Indian Journal of Research, 5 (7), 195-197.
- Kumari P. & Devi J., (2016), A Study of Body Mass Index among Kabaddi and Kho-Kho Players. International Journal of all Research education and Scientific Method, 4 (10), 40-43.
- Corral A. R., Somers V. K. & Sierra J. (2008), Accuracy of Body Mass Index in Diagnosis of Obesity in the Adult General Population. International Journal of Obesity, 32, 959-966.
- Sethi J., Sandhu J. S. & Imbanathan V., (2011), Effect of Body Mass Index on work related musculoskeletal disorder and occupational stress of computer workers in a developed ergonomic setup. Sports Medicine, Arthroscopy, Rehabilitation, Therapy and Technology, 2011, 3 (22), 1-7.
- Mazic S., Djelic M. & Suzic J., (2009), Overweight in Trained Subjects-are we looking at wrong number (Body Mass Index compared with Body Fat Percentage in Estimating Overweight in Athletes.). Gen. Physiol Biophys., 2009, 28, 200-204.
- Ali S. K. S. & Adhikari S. (2014), Physical and Anthropometric Characteristic of Kabaddi Players. Indian Journal of Applied Research, 4 (1), 464-465.
- Miller M. G., Herniman J. J. & Ricard M. D., (2006), The Effect of A 6-Week Plyometric Training Program on Agility. Journal of Sports Science and Medicine, 5, 459-465.
- Sekulic D., Spasic M. & Mirkov D., (2013), Gender-Specific Influence of Balance, Speed and Power on Agility Performance. Journal of Strength and Conditioning Research, 27 (3), 802-811.
- Raya M. A., Gailey R. S. & Gaunnaud I. A., (2013), Comparison of three Agility test with Male Servicemembers: Edgren Side Step test, T-test and Illinois Agility test. JRRD, 50 (7), 951-960.
- Paoule K., Madole K. & Garhammer J., (2000), Reliability and Validity of the T-Test as a measure of Agility, Leg Power, Leg Speed in College Men and Women. Journal of Strength and Conditioning Research, 14 (4), 443-450.
- Johnson T. M., Brown L. E. & Coburn J. W., (2010), Effect of four different Starting on Sprint time in Collegiate Volleyball Players. Journal of Strength and Conditioning research, 24 (10), Page no. 2641-2646.
- Duthie G. M., Pyne D. B. & Ross A. A., (2006), The Reliability of Ten meter Sprint Time using different Starting Techniques. Journal of Strength and Conditioning Research, 20 (2), 246-251.
- Marques M. C. & Izquiero M., (2014), Kinetic and Kinematics Association between Vertical Jump and 10-M Sprint Time. Journal of Strength and Conditioning Research, 28 (8), 2366-2371.
- Abdossaleh Z. & Ahmadi F., (2013), Assessment of Queens Step test for Estimation maximum oxygen uptake (VO2 max). International Journal of Sport Studies, 3 (6), 617-622.
- Bandyopadhyay A. & Bandyopadhyay P., (2007), Cardiorespiratory Fitness in College Students of Uttar Pradesh, India. Journal of Exercise Science and Physiotherapy, 3 (1), 44-47.
- Chatterjee S., Chatterjee P. & Mukherjee P. S., (2004), Validity of Queens College Step test for use Young Indian Men. Br J Sports Med, 38, 284-291.
- Chatterjee S., Chatterjee P., & Bandyopadhyay A., (2005), Validity of Queens College Step test for Estimation Maximum Oxygen uptake in Female Students. Indian Journal of Medical Research, 121, 32-35.
- Radhouane, Sassi H., Wajdidardouri & Yahmed M. H., (2009), Relative and Absolute Reliability of a Modified Agility T-Test and its relationship with Vertical Jump and Straight Sprint. Journal of Strength and Conditioning Research, 23 (6), 1644-1651.
- Zou Z., Chen P. & Yong Y (2018), Relationships among anthropometric characteristics, muscular fitness, and sprint performance in adolescents, 26, 89-94.
- Wong P. L., Chamari K., Dellal A. & Wisloff U., (2009), Relationship between Anthropometric and Physiological Characteristics in Youth Soccer Players, 23 (4), 1204-1210.
- Chen X., Cui J., Zhang J. & Peng W., (2020), The association between BMI and health related physical fitness among Chinese college students: a cross-sectional study, 20

- (444), 1-7.
26. Dhapola M. S. & Verma B., (2017), Relationship of body mass index with agility and speed of university players, 4 (2), 313-315.
  27. Hidayat M., Saraswati p., Widnyana M. & Kinandaa G., (2022), Correlation between Body Mass Index towards Agility Football Athletes in Melawi regency, 10 (3), 215-222.
  28. Shah H., Prajapati T. & Singh S. K., (2016), Association of Body Mass Index with VO<sub>2</sub>max in Indian adults, 5 (1), 155-159.
  29. Simanjuntak V., Rahayu T. & Yudhistira D., (2022), Analysis of Body Mass Index and Physical Condition of Martial Athletes in West Kalimantan Province: Study towards PON 2021, 10 (4), 768-774.
  30. Kumar N., Archana, Priyanka S., (2015), To determine Association of Cardiorespiratory Fitness with Anthropometric Characteristics in Collegiate athletes, 9 (1), 27-30.