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Analysis of the range of motion with respect to selected joints among female Kabaddi players

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Abstract
The present study aimed at for the collection of the required data, 40 female Kabaddi players were selected as subjects (n = 40). The study was restricted to Dakshina Kannada and Udupi districts and also included players who have participated in intercollegiate, inter-university, and district championships in the last 5 years. The subject's age ranges between 16-25 years. The gathered data from subjects will be statistically treated, with mean, standard deviation and standard variance values being used to portray the data using appropriate table. All the statistical treatment was carried out by using advanced Microsoft Excel at a significance level of 0.05. After statistical analysis, the study discovered that the same type of joint had varying ROM, which could have an impact on players' training. Because of the nature of their joints and surrounding tissues, females have more ROM than males. To perform sound skills in the game, Kabaddi players typically require a high level of flexibility at the shoulder and hip joints.

Keywords: Range of motion, joints, Kabaddi etc.

Introduction
Range of motion (ROM) is an aspect of sports science that assists in the determination of how far a particular joint can move. Joint flexibility as defined by the ROM of the particular structure is essential to both injury prevention, as well as measuring rehabilitative progress after an injury. Joints that are capable of an additional range of motion typically permit the athlete to move with greater grace and power. (Brett Sears, 2020) [2].
ROM is measured by the number of degrees that a joint can be moved without the application of external force from a determined position. The common tool used to perform the measurement is a double-armed goniometer, an instrument used to calculate geometric angles. Each joint, by virtue of its unique structure, has a different optimum ROM. Particular attention is paid by sports scientists to the ROM of the shoulder, elbow, wrist, hip, knee, and ankle. All joints in the body are capable of ROM measurement. (Brett Sears, 2020) [2].
The measurement of shoulder ROM is a complex one, due to the variety of ways that the shoulder is called on to move in different sports. The ROM of the shoulder of a baseball pitcher will bear different considerations than the ROM of the shoulder of a cross-country skier. The forces directed into the shoulder joint in each sport are significantly different, both in terms of the degree of the force as well as the direction that the shoulder is required to move. For this reason, the shoulder ROM will be determined from a variety of perspectives: abduction, with the arm extended from the body; adduction, with the arm pulled in toward the body; flexion, in a bending motion; extension, in a straightening or extending motion; hyperextension, extending the joint past 180° of motion; and rotation, the movement of the joint in a circular motion, in both clockwise and counter clockwise directions. In a hinge joint such as the elbow or the knee, the ROM measurement is simplified. The key determination in these joints is the relationship between the flexion (bending) and the extension (stretching). In the elbow, a normal person can bend the elbow sufficiently back that the wrist approximately reaches the ear. If the wrist is moved from a position with the arm extended parallel to the floor, the angle created by the flexion is approximately 140°. If the person is able to extend the wrist past the point where the arm is parallel to the floor, this is described as a hyperextension of the elbow.

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Significance of the study
1. This study is helpful in finding out the range of motion in the various joints, which is helpful for the Kabaddi players to identify their movement.
2. This is helpful for the players, physical education teachers, physical education directors, trainers, and coaches in order to know the range of motion in particular joints of a Kabaddi player.
3. The study may be helpful to female Kabaddi players to enhance their performance.
4. The study can also be helpful to trainers to rectify a particular skill of their trainees.

Methodology
Selection of subject
For the collection of the required data, 40 female Kabaddi players were selected as subjects (n = 40). The study was restricted to Dakshina Kannada and Udupi districts and also included players who have participated in intercollegiate, inter-university, and district championships in the last 5 years. The subject's age ranges between 16 -25 years.

Selection of the test item
For the purpose of data collection, the investigator used the manual Goniometer to measure the active Range of motion (ROM) of various joints. It is necessary that a single notation system be used in Goniometry. The neutral zero method (0-to-180-degree system) is the most widely used method. The same Goniometer should always be used to reduce the chances of instrumental error.

Procedure of test administration and collection of data
The measurements performed were taken with prior permission from the respective coach and were taken with the help of an assistant. The procedure of the measurement process was explained prior to the test. Firstly, the joint was selected and the midpoint was marked on the base, using a Goniometer. The range of motion is stated. The measurement is done by the manual method by adjusting the apparatus to the midpoint of the selected joint. Reading was recorded on a self-prepared score sheet in MS Excel.

Statistical analysis
The hypothesis will be tested using appropriate statistical techniques. The gathered data from subjects will be statistically treated, with mean, standard deviation and standard variance values being used to portray the data using appropriate table. All the statistical treatment was carried out by using advanced Microsoft Excel at a significance level of 0.05.

Analysis and Interpretation of Data

Table 1: The following table showing overall analysis of ROM of selected joints among female Kabaddi players

Joints		F	E	UD	RD	PF	DF	IN	EV	AB	AD
Shoulder	M	120.74	57.857							136.0	
	SD	32.421	8.554							28.88	
	SV	1051.1	734.18							834.3815	
Hip	M	124.57	27.771							42.257	30.08
	SD	4.089	3.686							3.248	2.501
	SV	16.722	13.593							10.54	6.2
Ankle	M					51.857	22.257	18.656	16.853		
	SD					0.689	0.815	0.653	0.866		
	SV					16.6554	23.254				
Wrist	M	74.085	73.457	32.342	21.085						
	SD	4.1683	6.455	4.658	1.915						
	SV	17.3747	41.6672	21.7025	3.6689						
Knee	M	140.685									
	SD	7.250									
	SV	42.5747									
Elbow	M	147.657									
	SD	7.2149									
	SV	52.055									

Key: F-flexion, E-extension, UD-ulnar deviation, RD-radial deviation, PF-planter flexion, DF-dorsi flexion, IN-inversion, EV-eversion, AB-abduction, AD-adduction-mean, SD-Standard deviation, SV-Standard variance.

The examination of ROM of chosen joints, such as the shoulder, hip, ankle, knee, wrist, and elbow, is shown in Table 1. All of the selected joints' mean, standard deviation, and standard variance are shown in the table. The analysis looks at flexion, extension, ulnar deviation, radial deviation, plantar flexion, dorsi flexion, inversion, eversion, abduction, and adduction in this study. Following the analysis, it was discovered that the same structure joints have different levels of ROM.

Discussion on findings
After statistical analysis, the study discovered that the same type of joint had varying ROM, which could have an impact on players' training. Because of the nature of their joints and surrounding tissues, females have more ROM than males. To perform sound skills in the game, Kabaddi players typically require a high level of flexibility at the shoulder and hip joints.

Conclusion
1. The study attempted to evaluate the Range of Motion with respect to selected joints among female Kabaddi players.
2. The conclusion was that the shoulder joint exhibits more range of motion than other joints and the shoulder joint has greater ROM than the other movements.
3. The conclusion was that the wrist joint has more flexion than the ankle joint and the knee joint and elbow joint have the same level of range of motion with respected Range of Motion with selected joints among female Kabaddi players.

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