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BIOMECHANICAL INVESTIGATION OF THE CHANGING KINEMATIC IN SHOW-JUMPING EVENT

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ABSTRACT: -

The present study was designed to investigate the difference in the mechanism of fence jumping by Athlete Horse. The aim of the study was to find the difference in mechanics between different types of jump designed in the show jumping circuit. Twenty show-jumper horses were selected

and given trails on type of jumps. This inquiry was conducted on the athletic horses that were specializes in the show jumping event. Two cameras were placed to record the video of the jumps. First camera was placed on right side of the jump and second camera in front of the jump. Successful jumps were selected, slashed, digitalized through video motion analysis software to getter the kinematic data. The main technical aspects of specific proof of jumping the horse over the different type of fences was examine from the kinematic point of view. Using the Motion analysis software – Max Traq 2D, the study received a series of kinematic parameters (time, position, angles) discussed specific issues in research, processing and interpretation leading to the general conclusion, that Successful jumping i.e. crossing the designed jumps are in?uenced by take-off distance, jumping velocity and forelimb ?exibility. Selection of horses for superior jumping capacity and performance can be aided by kinematic analysis, which may shorten training time and improve performance.

KEYWORDS: *Biomechanics, Athlete horse, show jumping, Kinematics, motion Analysis Software.*

INTRODUCTION :

The world of games and sports is ever expanding with increasing intensity of competition and enlarging scientific studies of human movements. The intense complex movement for the top level performance in sports calls for great amount of physical capacity, Physiological capacity, Psychological capacity and mechanical capacity too (Hay, 1993). To make the mechanical movement efficient and effective a mechanical development is require. For fulfilling the purpose a Biomechanical evaluation techniques are adopted.

A sport on horseback was the part of training to be a good soldier. The attractive natures of the horse and his versatility have appealed to man for longer, probably, than history relates. For centuries the horse was the principal means of transport but now the emphasis has moved from utility to pleasure. Gradually different breeds of horses and ponies have been selected, developed and improved to suit a wide variety of equestrian activities, and those lucky enough to have enjoyed contact with horses realize that they have much more to offer than faster, noisier and lifeless alternatives (Roberts, 1989). They are easy to train and unusually adaptable - the same horse can be successful in eventing, show jumping, dressage, racing, team chasing, and etc. One of the greatest attractions of riding is that it can be enjoyed at every level, according to skill and experience either as active

participants or interested spec¬tators (Watson, 1989).

Show jumping is a relatively new equestrian sport. Which came into force in England in the 18th century. A jumping competition is one in which combination of the horse and competitor is tested under various conditions over a course of obstacles. It is a test intended to demonstrate the horse's freedom, its energy, its skills and its obedience in jumping and the competition's horsemanship.

Jumping competition had been taken place after the Second World War. It appears that the first competition for show-jumping took place in Paris in 1866. In 1912, show jumping was included in the Olympic Games for the first time (FEI, n.d.). At that time eight countries got together to draw up the rules for some guidelines for show jumping, i.e: Belgium, Denmark, France, Italy, Japan, Norway, Sweden and the United States of America. There are five types of show jumping events in the equestrian sports i.e.: Topscore, Knockout jumping, Rescue relay, Puissance and six bars.

The main complexity in show jumping event seems to be the obtaining high jumping performance of the horse over the fence in as short as possible time, generating maximum power, maintain the balance, reducing the injury and having great efficiency (Morgan, 1962).

Various authors introduces the methods for assessing the variability of horse and human movement and superior methods for data analysis specific to horse movement in jumping event. The methods used to obtain such information must satisfy the scientific requirements in terms of confidence and accuracy of the methodology for their application. For kinematic characteristics, Real-time motion analysis is the essential tool in monitoring sportive technique, on is an and involves the existence of an operational system through which the data that are acquired by using software technology, can be processed, interpreted and exploited for accurate description and awareness of the technical issues. (Payton & Bartlett, 2008).

The study aim to bring out the specific kinematic element to jump by the horse in show jumping event. To draw the conclusion the study finds the difference in the jumping the obstacle successfully.

METHODOLOGY:

The research protocol followed during the investigation was presented in five sections as preliminary investigation, selection of subjects, filming procedure, selection of trails and selection of frames for analysis.

For the study one Jumping mare of age of five year old and height = 170 cm was examined to jump parallel jump at the height & width of 100 cm and 80 cm respectively. The mare was academy-level jumping horse at national division in an equestrian sports club in India. Participating mare was free from musculoskeletal injury/pathology at the time of data collection.

A Canon camera was used to record motion of the horse while jumping the obstacle i.e: parallel bar jump. A 2-D kinematic data from the right extremities of the horse at 50 Hz was captured from each trail performing maximal jumping with a 4 stride run up and an approach. The jump was positioned such that it allowed the horse to take clear jump over the parallel jump. In accordance to the protocol the camera was position perpendicular to sagittal plane of the jumping motion to record the full motion. Two Dimensional calibrating frame was used to calibrate the video of the jumping motion of the horse over the obstacle.

The Angles of Joints (Elbow, Knee, Stifle and Hock), Velocity during Different phases (Take-off, In-flight and Landing) and Stride length were selected as the parameter of the study. A t-test statistical procedure was used to draw the result.

Result and Discussion:

Table no. 1

Variables		No.	Mean.	S.D	t-value
V_t	SS	06	7.48	0.46	3.231*
	US	06	6.05	0.99	
V_f	SS	06	5.90	0.35	4.249*
	US	06	5.08	0.32	
V_l	SS	06	6.85	0.29	1.079
	US	06	6.62	0.44	
SL	SS	06	2.28	0.26	3.566*
	US	06	1.76	0.25	

The analysis of data table-1 shows that there is a significant differences exist between both the successful jumps and unsuccessful jumps in Velocity (Vt) during Take-off phase, Velocity (Vf) during In-flight phase and Stride Length as obtain't' ratio is greater than the required 't' value of 2.228. Whereas insignificance differences in velocity of landing (Vl) exist between both successful jumps and unsuccessful jumps.

Table no. 2

Variables		No.	Mean.	S.D	t-value
EA	SS	06	118.17	10.03	1.995
	US	06	128.83	8.42	
KA	SS	06	179.33	0.817	0.286
	US	06	179.17	1.169	
SA	SS	06	100.17	3.76	3.166*
	US	06	111.50	7.92	
HA	SS	06	125.33	3.88	0.224
	US	06	126.00	6.16	

The analysis of data table-2 shows that there is a significant differences exist between both the successful jumps and unsuccessful jumps in Stifle joint angle (SA) during jumping the fence as the obtain't' ratio is greater than the required 't' value of 2.228.

Whereas insignificance differences is found in Elbow joint angle (EA), Knee joint angle (KA) and Hock joint angle (HA) between both the jumps.

CONCLUSION:

The study present some reference values on biomechanics of jumping of horse over the fence. The Stride length of the horse before Take-off is directly proposal to the velocity during jump. Velocity during landing may affect the successful jump. Elbow joint angle and stifle joint angle helps the horse to cross over the fence. Whereas, Knee joint angle and Hock joint angle assist the horse during Take-off.

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