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Kinematic analysis of cast to support on Parallel bars in according to gymnast skill level

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Abstract

The purpose of this study was to investigate the Performance difference in Cast to support on Parallel bars according to gymnast skill level and to assist them to improve performances. Ten gymnast were selected who participated in All India Interuniversity gymnastics championship in this study and they were divided into two groups i.e. skilled group (n=5) and less-skilled group (n=5) and t-test was used to find the difference at the moment of kicking and pulling up phase between groups. To test the equality of variances, Levene's test was used. The F-value for testing the homogeneity of variances is insignificant found only in the neck joint as the p-value is more than.05 and rest of the variables i.e. shoulder joint, hip joint, center of gravity and performance were found significant, and it is concluded that if the coach improves the hip joint extension through stretching exercises and develop the shoulder muscles strength then the performance of the gymnast of less skilled group in cast to support will develop faster.

Keywords: Kinematic, Gymnastics, Cast to support, Parallel bars.

Introduction

Cast to support is an element which is performed on Parallel bars in Men's Artistic Gymnastics, It is a basic movement for learning the advance skill involving releasing and re-grasping the grip upper the bars (e.g.- Cast with $\frac{1}{2}$ turn to support, Basket to handstand, felge with $\frac{1}{2}$ turn. to upper and support arms, etc.). Cast to support is an "B" class element comes under the EGR – IV i.e. under swings as per the "MAG code of point 2017". Cast to upper arm hang, Shoot up action and Kip on parallel bars are the prerequisites for learning this element. The present study here by makes an effort to broaden the horizon of knowledge by bringing new facts and thoughts by investigating the kinematic analysis of cast to support on parallel bars in according to gymnast skill level. Therefore, I tested the hypothesis that is there any significant comparison at the moment of kicking and pulling up phase between groups in the cast performance of the gymnast.

Methodology

The methodology of the study consist of selection of subjects, selection of variables, criterion measures, filming protocol, testing procedure and the technique employed for analysis of data. Ten male gymnasts (n=10) of Lakshmibai National institute of Physical Education, Gwalior from the gymnastics match practice group, who had a good command in the particular skill (cast to support on parallel bars), and was divided in to the two groups according to their skill level (Skilled group n = 5, Less skilled group n = 5)were selected as the subject for the present study and there range of mean age, mean height and mean weight was $20.2 \pm .84$ years, 166.8 ± 4.60 cm and 62.7 ± 6.45 kg respectively.

Videography was employed for the biomechanical kinematics analysis of cast to support on parallel bars. The camera that was used for this study was a standard Canon – 70D camera was used. The video camera was mounted on the tripod stand at the height of 1.95 mts. from the ground. The video camera was placed perpendicularly at center in the line of inner bar and parallel to the sagittal plane at a distance of 4.23 mts. The distance of the camera from the center of filming zone is kept 4.23 mts. The frequency of the camera was 24 frames/second. The subjects performed the skill three times and the best trail was used for the analysis.

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Fig 1: Photographic sequence of selected phases (starting from right) of the whole skill



Fig 2: Kicking and pulling up phase indicating Center of gravity

Videography technique was employed in order to register the performance of the subjects in cast to support on parallel bars in the study. Selected kinematics variables and kicking and pulling up phase phases (Figure 2) were analyzed. The selected phases were taken out from the video by using

snipping tool software. From the photographic sequence, the stick figures of the selected movements were located by kinovea software and the centre of gravity was located also by using Kinovea software, and the selected angular kinematic variables were obtained from the selected phase i.e. kicking up and pulling up phase. Angles of selected joints were measured by the help of Kinovea software at the nearest of degrees. The performance of each subject of cast to support on parallel bars was collected on the basis of three judge’s evaluation. The average of three judges was considered as the final point obtained by each gymnast. Further, to easy calculation it was reduced out of ten points. The kinematic analysis of cast to support on parallel bars in according to gymnast skill level were obtained by employing the Independent T test technique by using SPSS (20.0) and for testing the hypothesis the level of significance was set at 0.05.

Results and Discussion

The Independent T test of selected kinematics variables with dependent variable are presented separately in the preceding tables, The results of the Independent T test which were obtained in order to ascertain the comparison of two groups on selected kinematics variables i.e. the angle at neck (in relation to torso), Left shoulder joint and left hip joint with the performance of cast support on parallel bars during initial kicking up and pulling up phase, after the analyzing of the groups with the reference to the performance of the gymnast the neck joint having no significant difference and expect shoulder joint, hip joint and the center of gravity shown the significant differences with respect to the performance, The differences in cast to support on parallel bars according to skill level were found in angle of hip joint and shoulder joint and it is recommended, therefore, for the improvement of performance of gymnast, that the stretching exercise to maintain extension position of hip joint at shoulder muscle strength training to be enhanced.

Group Statistics					
	Total Groups	N	Mean	Std. Deviation	Std. Error Mean
Neck Joint	Skilled group	5	179.4000	6.73053	3.00998
	Less skilled group	5	177.4000	3.84708	1.72047
Shoulder Joint	Skilled group	5	57.0000	3.16228	1.41421
	Less skilled group	5	70.4000	4.15933	1.86011
Hip Joint	Skilled group	5	116.4000	3.36155	1.50333
	Less skilled group	5	103.8000	4.32435	1.93391
Center of Gravity	Skilled group	5	180.2000	4.43847	1.98494
	Less skilled group	5	166.6000	2.40832	1.07703
Performance	Skilled group	5	7.8280	.20413	.09129
	Less skilled group	5	5.9300	.40175	.17967

Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Neck Joint	Equal variances assumed	1.479	.259	.577	8	.580	2.0000	3.46699
	Equal variances not assumed			.577	6.362	.584	2.0000	3.46699
Shoulder Joint	Equal variances assumed	.118	.740	-5.735	8	.000	-13.4000	2.33666
	Equal variances not assumed			-5.735	7.466	.001	-13.4000	2.33666
Hip Joint	Equal variances assumed	.472	.511	5.144	8	.001	12.6000	2.44949
	Equal variances not assumed			5.144	7.541	.001	12.6000	2.44949
Center of Gravity	Equal variances assumed	1.894	.206	6.022	8	.000	13.6000	2.25832
	Equal variances not assumed			6.022	6.167	.001	13.6000	2.25832
Performance	Equal variances assumed	3.281	.108	9.418	8	.000	1.8980	.20153
	Equal variances not assumed			9.418	5.936	.000	1.8980	.20153

*Significant at 0.05 level

* Degree of freedom= 8

To test the equality of variances, Levene's test was used. The F-value for testing the homogeneity of variances is insignificant found only in the neck joint as the p-value is more than .05. and rest of the variables i.e. shoulder joint, hip joint, center of gravity and performance were found significant, and it is concluded that if the coach improves the hip joint extension through stretching exercises and develop the shoulder muscles strength then the performance of the gymnast in cast to support will develop faster.

Conclusions

Based on the analysis and within the limitation of present study following conclusion were drawn:

- 1) Selected kinematic variables (Neck joint) did not show any significant relationship with the performance of cast to support on parallel bars in kicking and pulling up phases.
- 2) Kinematic variables like Shoulder joint, hip joint, center of gravity and the performance have shown significant relationship with the performance of cast to support on parallel bars.

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