Relationship of Selected Kinematic Variables with the Performance of Cast to Support on Parallel Bars in Men's Artistic Gymnastics

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ABSTRACT

The purpose of this study was to investigate the relationship of cast kinematic variables with the performance of cast to support on parallel bars in men's Artistic Gymnastics. A total of five (n=5) best male gymnasts of 18 to 23 year old from L.N.I.P.E gwalior (M.P.) were selected for the present study, as subjects.

To collect kinematic data, a digital canon - 70D camera was used, with the frequency of 24 frames per second , during the execution, by placing it left side parallel and perpendicular to the sagittal plane. From the video, the photograph of selected four phases(i.e.initial swinging phase, kicking and pulling phase, flinght phase and re-graphing phase) were obtined 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 of required phase i.e. initial swinging phase, pulling up phase and flight phase was located by using kinovea sofware. To determine the degree of relationship between selected kinematic variables (line and angular) with the cast performance of gymnasts on pararllel bars, Pearson's Product Moment Correlation technique was used. The level of significance was set at 0.05.

The results revealed that all selected linear and angular kinematic variables, at all the phases, had shown insignificant relationship (r<.878) with the dependant variable (cast performance).On the basis of results, it is concluded that the performance of any games and sports depends upon the multidimensional factors such as physical, physiological, psychological and so many other factors.Only due to slight association in the selected kinematics variables, the performance of the asthlete cannot vary directly.

KEYWORDS

Kinematics, Parallel Bars, Sagittal plane

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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 1/2 turn to support, Basket to handstand, felge with 1/2 turn. to upper and support arms, etc.). Cast to support is an "B" class element comes under the EGR-4 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 hereby makes an effort to broaden the horizon of knowledge by bringing new facts and thoughts by investigating the relationship of selected kinematic variables with the performance of cast to support on Parallel Bars in men's artistic Gymnastics. Therefore, we tested the hypothesis that there is the significant relationship in all selected kinematic variables with the cast performance (one tail hypothesis)

METHODOLOGY

The methodology of the study consists of selection of subjects, selection of variables criterion measures, filming protocol, testing procedure and the technique employed for analysis of data. Five male gymnasts 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), were selected as the subjects for the present study and their range of mean age, mean height and mean weight was 20.2+.84 years ,166.8+4.60cm and 62.7+6.45kg, respectively.

Videography was employed for the biomechanical kinematic analysis of cast to support on parallel bars. The camera that was used for this study was a standard canon -70D camera. The video camera was mounted on the tripod stand at the height of 1.95 m, from the ground. The video camera was mounted on 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 m. The frequency of the camera was 24 frames/second. The subjects performed the kill three times and the best trial was used for the analysis.

Videography technique was employed in order to register the performance of the subjects in cast to support on Parallel Bars in the study. Selected kinematic variables (Table 2 and Table 3) and four selected phases (Figure 1) of whole skill i.e. positioning of initial swinging phase, kicking up and

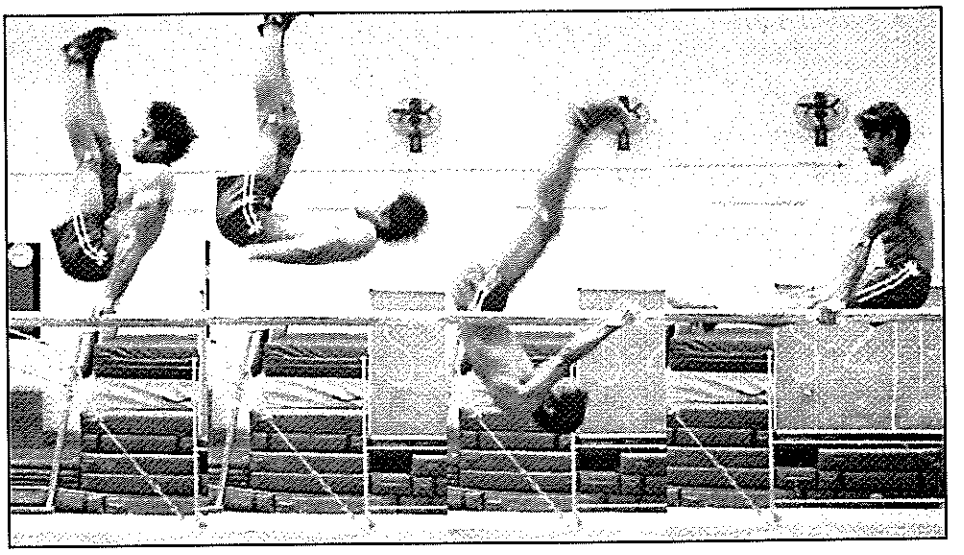

Fig.-1: Photographic sequence of selected phases (starting from right) of the whole skill

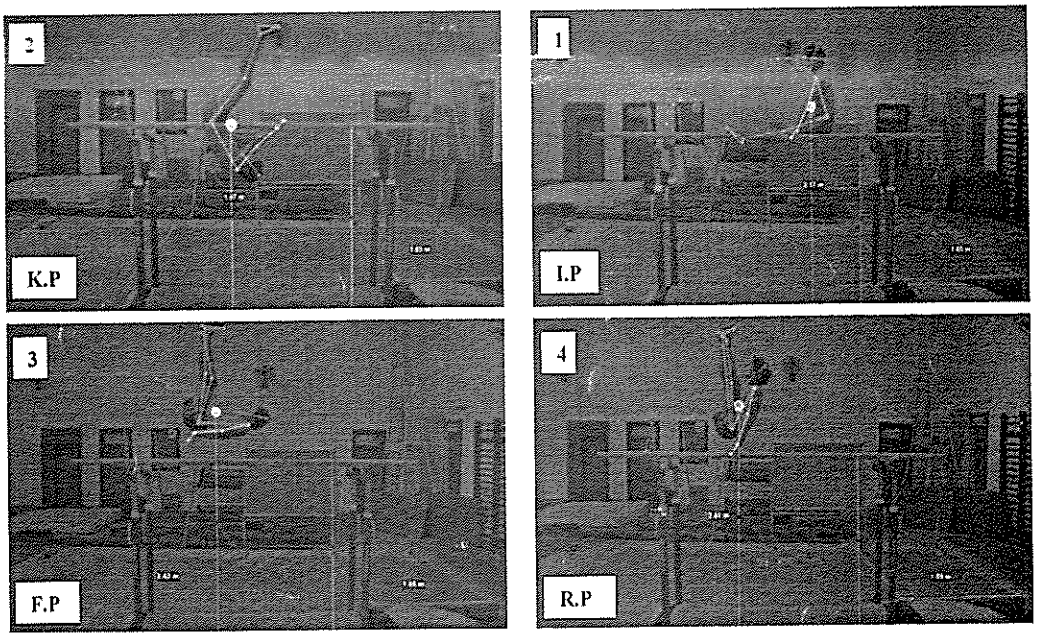

Fig-2: Selected Phases indicating Center of gravity.
(1. I.P- Initial swinging phase; 2. K.P- Kicking and pulling phase; 3. F.P- flight phase; 4. R.P- Re-grasping phase).

pulling up phase, flight phase and re-grasping phase were analyed. 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 of required phases i.e. initial swinging phase, pulling up phase and flight phase were located by using Kinovea software, and the selected angular kinematic variables were obtained at initial swinging phase kicking up and pulling up phase, flight phase and re-grasping 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 there judge's evaluation. The average of three judges was considered as the final point obtained by each gymnast. Further, for easy calculation, it was reduced out of ten points. The evaluating criteria are mentioned in Table 1.

Table-1: Evaluating Criteria of cast to support on parallel bars

S.NO	COMPNENTS	POINTS
1.	Body position during initial swinging phase	10
2.	Body position during pike phase	10
3.	Body position during kicking up and pulling up phase	10
4.	Body position during re - grasping phase	10
5.	Overall Execution of whole movement	10
	Total	50

The relationship of selected kinematic variables with the performance of cast of support on parallel bars were obtained by employing the Pearson's product moment correlation technique by using SPSS (20.0) and for testing the hypothesis the level of significance was set at 0.05.

RESULTS & DISCUSSION

The coefficient of correlation (r) of selected angular the linear kinematic variables with dependent variable are presented separately, in the preceding Table, The results of the product moment correlation which were obtained in order to ascertain the relationship of selected angular kinematic variable 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 swinging phase, kicking up and pulling up phase, flight phase and re-

Table-2: Relationships of selected angular kinematic variables with the cast performance

S.NO	Variables	Initial swinging phase (r)	Kicking & Pulling up phase (r)	Flight phase (r)	Re-grasping phase (r)
1.	Angle at neck (in relation to torso)	-8.75	.778	.364	.280
2.	Shoulder Joint (Left)	-.714	-.457	.229	.508
3.	Hip Joint (Left)	.692	-.291	.128	-.464

* Significant at r0.05 (3) = 0.878

grasping phase have been presented in Table 2.

The findings of Table 2 clearly revealed that all the variables in all phases were less than the tablulated value (r=.878) at 0.05 level of significance. In that case the null hypothesis was accepted for all variables in all phases. The results of product moment correlation which were obtained in order to ascertain the relationship of the selected linear kinematic variable i.e; height of center of gravity at initial swinging phase, height of center of gravity at pulling up phase, height of center of gravity at flight phase, time taken during complete movement and total horizontal displacement covered on bars with the performance of cast to support on Parallel Bars has been presented in Table 3 mentioned below:

Table-3: Relationships of selected linear kinematic variables with the cast performance

S.NO.	Variables	Correlation (r)
1.	Height of C.G. at initial swinging phase	-.269
2.	Height of C.G. at kicking up and pulling up phase	.275
3.	Height of C.G. at flight phase	.465
4.	Time taken during complete movement	.501
5.	Horizontal displacement covered on bars	-.805

* Significant at $r_{0.05}$ (3) = 0.878

The findings of Table 3 also showed insignificant relationship of all the variables with the performance of the Gymnasts in cast to support on Parallel Bars. Because, the value of coefficient correlation (r) was less than the tabulated value (r=.878) at 0.05 level of significant.

The linear and angular kinematic variables showed insignificant relationship in case of all the variables in all phases of skill with the cast

performance. The similar types of studies were undertaken by other research scholars also and mostly variables with the dependant variables were showed insignificant, except very less kinematic variables in there are of specialization. The main reason of insignificant results, in their sports, was that the performance of any games and sports depends upon the multi-dimensional factors such as physical factors, physiological factors, psychological factors; and so many other factors. Only due to the slight association in the selected kinematic variables, the performance of the athlete cannot very directly.

All other linear and angular kinematic variables, at all the phases, did not show the significant relationship. Because, in Gymnastics, these linear and angular kinematic variables are associated with the techniques; but, the whole performance regarding the skills and techniques consist of the variety of dominating factors that influence the gymnast's performance. Not even in gymnastics, these finding may be supported to all games and sports.

Small sample size, level of performance of gymnasts and unavailability of sophisticated equipments may be one of the reasons of indicating insignificant relationship of selected linear and angular kinematics variables to performance in Gymnastics.

CONCLUSIONS

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

1. All the selected angular kinematic variables did not show any significant relationship with the performance of cast to support on parallel bars at all phases.
2. All the selected liner kinematic variables also did not show any significant relationship with the performance of cast to upper arm hang on parallel bars.

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