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The Relationship between Front Flip Movements on the Gymnastics Balance Beam and the Selection of Movement Variables

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Abstract: ***Gymnasts are expected to demonstrate with beauty and flair. They should keep their body in the perfect position. Performance on beam started with mount and dismount considered to be as salto. This study aim was to find out the relationship between selected kinematic variables with the performance of forward turn over on balance beam in women artistic gymnastics. Five female gymnasts of Lakshmibai National Institute of physical education, Gwalior from the gymnastics match practice group, who had a good command in the particular skill (forward turn over on balance beam), were selected as the subject for the present study. . The video camera was placed perpendicularly at centre in the line of inner bar and parallel to the sagittal plane at a distance of 6mts and height of 2.10mt. Performance were evaluated by three judges on set criteria. Pearson product moment correlation was applied at 0.05 level of significance. There was a significant correlation between the angle at hip and the forward turn over performance of the gymnasts at landing phase only. The radius of rotation is likely to increase because increase in moment of inertia(I) which results decrease in angular velocity and helps the body to remain in linear velocity at landing phase as late as possible.***

Keywords: Balance Beam, Moment of Inertia, Forward Turn over

1. Introduction

Artistic gymnastics is the best known of the gymnastics sports governed by the federation international de gymnastics FIG. Artistic gymnastics, typically involves the women's events of uneven bars, vaulting table, balance beam, floor exercise. The main objective of this study was to find out the relationship of selected kinematic variables with the performance of forward turn over on balance beam in women artistic gymnastics.

Forward turnover is a forward acrobatic element. Gymnast had to performed 360 Degree over-head turn with intermediate support. When gymnast take the initial Position, the body should be in one line, arm side of the ears and legs slightly apart. When rotating the body along with the axis simultaneously holds the beam and the head should be slightly out. While completing the 360-degree rotation, legs should come one by one on the beam and arms side of the body.

2. Methodology

Five female gymnasts of Lakshmibai National Institute of physical education, Gwalior from the gymnastics match practice group, who had a good command in the particular skill (forward turn over on balance beam), were selected as the subject for the present study. The following kinematic variables were selected in handspring on vaulting table for the purpose of study: -

a) Angular kinematic variables of forward turn over on balance beam.
- Angle at left shoulder joint.
- Angle at left hip joint.
- Angle at left knee joint
- Angle at left ankle joint.

b) Linear kinematic variables of forward turn on balance beam.
- Height of the center of gravity at the time of take-off from the board.
- Height of centre of gravity during the contact phase.
- Height of the centre of gravity during the post flight.
- Height of the centre of gravity during the landing.

The performance of forward turn over on balance beam of each selected subject was taken as the criterion measure for the purpose of present study. The performance was recorded on the basis of execution of the skill. This was evaluated by 3 judges on the following criteria which are explained in table-1.

Table 1: Evaluating criteria of forward turn over on balance beam

S. No	Point	Components
1	10	Initial position
2	10	Placement of the hands and leg swing
3	10	Push off phase
4	10	Landing phase
5	10	Body position during execution
	50	Total

3. Procedure of Data Collection

Selected kinematics variables and four selected phases of selected skill i.e. take off phase, contact phase, post-flight phase and landing phase were analysed. The centre of gravity of required phases i.e. standing phase, contact phase, landing phase located by using segmentation method. Angles were measured with the help of Protractor. The performance of each subject of forward walkover on balance beam 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.

The video camera was mounted on the tripod stand at the height of 2.10 mts. from the ground. The video camera was placed perpendicularly at centre in the line of inner bar and parallel to the sagittal plane at a distance of 6mts. The subjects performed the skill three times and the best trail was used for the analysis.

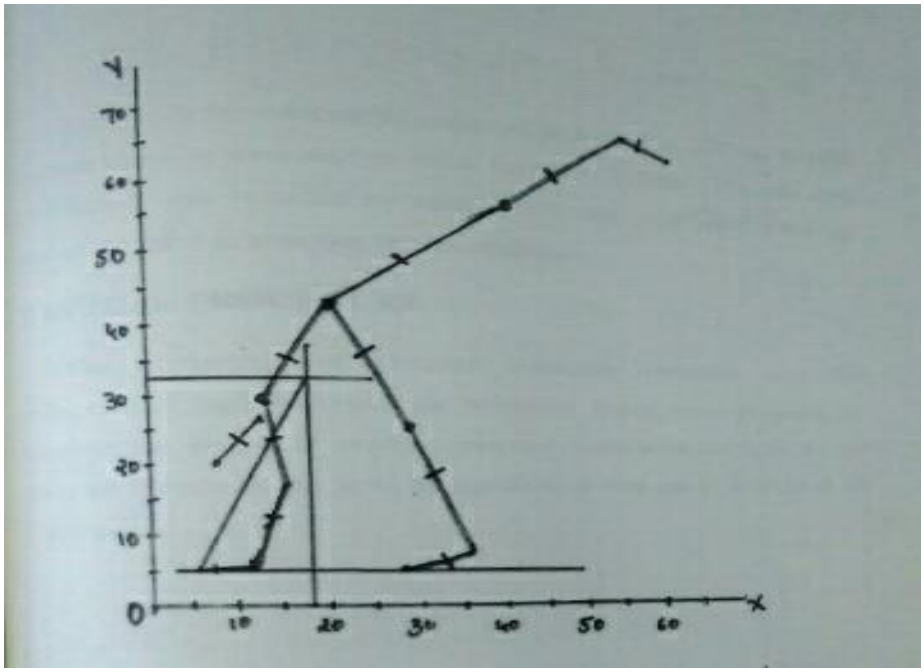

Figure 1: Height of Center of Gavity at Initial Phase

Statistical Procedure

The relationships of selected kinematic variables with the performance of handspring on vaulting table were obtained by employing the Pearson's product moment correlation method. The level of Significance was set at 0.05.

4. Results

Table 2: Relationship between selected Angular Kinematic Variables with the Forward Turn over Performance in Gymnastics

S. No	Angular Variables	Initial phase (r)	Arms on the beam (r)	Foot placement
1.	Shoulder Joint (Left)	0.420	0.089	0.827
2.	Hip Joint (Left)	-0.321	0.918	0.826
3.	Knee Joint (Left)	-0.399	-0.099	0.485
4.	Ankle Joint (Left)	0.161	0.835	0.051

The findings of table 2 clearly revealed that the angle at hip joint at post flight phase had shown significant relationship (r = .918) with the performance of the forward turn over on the balance beam.. Because the value of coefficient of Correlation in case of all the variables was less than the tabulated value (r=.878) at 0.05 level of significance.

Table 3: Relationship between selected Linear Kinematic Variables with the Forward Turn over Performance in Gymsnastics

S. No	Linear Variables	Coefficient of Correlation
1.	Height of C.G at the time of initial movement	0.334
2.	Height of C.G at the time of support of arms on beam	0.581
3.	Height of C.G at the time of support of foot on beam	0.553
4.	Time of execution (time taken to complete movement i.e. starting position to finishing position)	0.485

5. Findings

From the above table it was concluded that there was a significant correlation between the angle at hip and the forward turn over performance of the gymnasts at landing phase. It could be understood that with an excessive increase in the angle of hip at landing phase, the performance tends to increase. In other words, both (hip angle and performance) are the directly proportional to each other at this phase. As gymnast keeps straight her hip at landing phase, the radius of rotation (r) is likely to increase because increase in moment of inertia(I) which results decrease in angular velocity and helps the body to remain in linear velocity at landing phase as late as possible after the strong push from the balance beam. Although, there is a significant relationship between both (hip angle and performance) the variables but, it cannot be concluded that, the angle at hip is only the dominating factor to influence performance. Small sample size, level of performance of gymnasts and

unavailability of sophisticated equipment's may also be one of the reasons of indicating insignificant relationship of selected linear and angular kinematics variables to performance in gymnastics.

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