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# Kinematic analysis of elongated start

**[1] Yatendra Kumar Sharma, [2] Dr. Jogiswer Goswami, [3] Dr. Sushil Sharma**
[1] Young Professional (RA), Ministry of Youth affairs and Sports
[2] Assistant Director, Amity University ASPESS, Noida, Uttar Pradesh, India
[3] Freelance Consultant-Industrial Quality (ISO 9001, 14001 & GMP)

**Abstract**
The start and acceleration from the blocks directly affect results in the sprint events. In this study, the major kinematic parameters of these phases of the race were analyzed. The subject of the study was the best Slovenian male sprinter, who was making his preparations for the 2006 IAAF World Indoor Championships. The study showed the following to be the key factors for performance in the two phases: the distance between the starting blocks, block velocity, block face angle, the length of the first step, the path of the vertical rise in the body' centre of mass in the first three meters, the contact phase/flight phase index in the first ten steps and the ratio between the length and frequency of steps. As the study was on only one athlete, the results cannot be generalized. However, they may contribute to explaining phenomena related to sprinting at the highest level.

**Keywords:** kinematic, sprinter, starting blocks, block velocity, block face angle

## Introduction

### Statement of the problem

The purpose of the study is carrying out kinematic analysis of bunch start.

### Delimitation

1. Study will be delimited to five male subject of National athlete.
2. Study will be delimited to the following kinematic variable
3. Angle at various joints
4. Centre of gravity
5. Height of centre of gravity from ground
6. location of centre of gravity within the base of support
7. Base of support

The study will be delimited to the following positions of bunch start and elongated start.

- On your mark
- Set

### Limitation

The accuracy of preparing the Elgon's and calculating the center of gravity and angles at various joints by manual process is considered as a limitation of this study.

Definitions and explanations of terms

### Kinematics

Kinematics is the branch of science, which describes the motion of objects, and groups of objects without consideration of the causes of motion.

**Photography:** Photography is the art and process.

**Centre of gravity:** Centre of gravity is a point on which body weight are balanced.

**Equilibrium:** Equilibrium is a state in which the resultant of all the forces. Acting on the body is zero.

**Angle:** Angle is the space between two intersecting lines or close to the point where they meet

**Joint:** "A structure in the human or animal body at which two parts of the skeleton are fitted together".

**Base of support:** It is the lowest part or edge of something, especially the part on which it rests support the object.

### Significance of the study

This is a Basic study to understand research approach in sports Biomechanics.

This study will be significant in reviling mechanically which technique is more stable, and the study will also the revel the factors which affect the stability and also why these techniques are used in various running event.

### Review related literature

Dr. Yadav S. (2014) [1] investigated that "The aim of the study is to assess the relationship between selected biomechanical variables with the performance in Javelin throw". Their age was between 17 to 25 years. The sequential photography technique was used to record the technique of javelin throw in athletics. Motor driven, Nikon D-40 camera was used for the data collection. The participants were photographed at stance position and release moment in sagittal plane. From the photographs, the stick figures were drawn by using Joint-point Method, and various biomechanical variables were obtained at the moment of releasing the javelin in the game of javelin throw, suggested by Hay. Pearson's product moment correlation was basically used to find out the relationship of selected biomechanical Variables with the performance of mainly male Javelin throwers. The level of significance was tested at .05. The angle right and left ankle joint and left elbow joint have shown significant relationships at stance position. In case of release moment shoulder joint (right) and elbow joint (left) it shows significant relationship with the performance of subject. The result of the height of Center of Gravity, at selected moments has insignificant relation with the performance of subject at both stance and release moment positions. Training focused on Right knee, ankle, hip and shoulder joint is recommended.

Mahdi Cheraghi, Hamid Agha Alinejad, *et al*. (2014) [4] the study was made to describe biomechanical parameters of head, upper and lower body extremities during a straight right punch throw related to performance and injury mechanism. Subjects were eight e1ite right-handed male (age 20.4 ± 2.1yrs; height 177.4 ± 8.5 cm; mass 70.4 ± 16.8 kg) amateur boxers. 3D motion analysis was used to assess the kinematics of the right side extremities and head. Ensemb1e averaging of time normalized kinematic parameters was executed to have better visual inspection. Results showed a similar pattern between subjects with some considerab1e variation in some parameters that pointed out to individualized pattern in elite boxers. Investigation of lower body joints kinematics explained boxers throw punch using 1eg drive. Stretch-shortening cycle detected in the technique implies potential for performance enhancing using plyometric. Head velocity measured in anterior-posterior and medial-lateral direction would intensify potential head injuries.

Bunari Tokushima, Ardija Omiya (2014), the investigation in this study differences in punt kicks by football goalkeepers based on the level of report required. Twelve experienced goalkeepers participated in the study. Participants were instructed to kick the ball as far as possible in the maximum distance trial (100% trial) and to have a more controlled approach for the 80% and 60% trials each punt kick was divided into three events: release of the ball from the lehand (BR), pivot foot ground-contact (LFC), and ball impact (IMP). Right lower limb joint velocity, right hip and knee joint angles, flight distance, ball velocity, and kick angle were calculated. e 80% and 100% trials yielded almost the same velocity for each part of the right leg; however, in the 60% trial, the level of kicking report was managed by adjusting the velocity of the right ankle joint, starting from BR, in addition to adjustment of the velocity of the right knee joint at LFC. Compared to punt kicks with a lower level of report, the punt kicks with a higher level of report involved an increase in the hip joint extension angle for the right leg during the backswing and the lowering of the knee joint angle of the right leg at the start of the forward swing, thus producing forward swing velocity for the right foot.

Chow W John, Ann F. Kuenster *et al*. (2003) [7] The purpose of the study was to identify those kinematic characteristics that are most close1y related to the functional classification of a wheelchair athlete and measured distance of a javelin throw. Two SVHS camcorders (60 field• s -1) were used to record the performance of 15 males of different classes. Each participant performed 6 – 10 throws and the best 2 legal throws from each subject were selected for analysis. 3D kinematics of the jave1in and upper body segments at the instant of re1ease and during the throw (de1ivery) were determined. The selection of kinematic parameters that were analyzed in this study was based on a jave1in throw model giving the factors that determine the measured distance of a throw. The average of 2 throws for each subject was used to give Spearman rank correlation coefficients under se1ected parameters and measured distance, and under the selected parameters and the functional classification. The speeds and ang1es of the jave1in at release, ranged from 9.1 - 14.7 m• s-1 and 29.6º - 35.8º, respectively, were smaller than those exhibited by e1ite ma1e ab1e-bodied throwers. As expected, the speed of the jave1in at re1ease was significant1y corre1ated to both the c1assification.

Alen Kapidžić, Tarik Huremović, *et al*. (2014) [8] this study establish which applied kinematic variables significantly contributed to the efficiency of the instep kick motion in soccer. The study sample comprised 13 boys (age: 13 ± 0.5 years; body mass: 41.50 ± 8.40 kg; body height: 151.46 ± 5.93 cm) from the FC Sloboda school of soccer. Each participant performed three kicks with maximum strength that were video recorded with two synchronized cameras (Casio Ex-F1) positioned 12 m away from the place of the kick. Data were collected by analyzing the video recordings of each kick. Data processing was performed using the APAS motion analysis system (Ariel Dynamics Inc., San Diego, CA). On the basis of the forward selection method of multiple regression analysis, we determined the correlations between the prediction variables and the selected criteria (speed of the ball; p = 0.01). On the basis of the regression coefficients, it was concluded that two variables significantly contributed to the speed of the ball: speed of the foot of the kicking leg at the time of contact with the ball (p = 0.01) and the distance between the angle support leg and center of the ball (“foot posterior displacement”) (p = 0.01). In order to achieve the best possible technical performance and, therefore, a higher speed of the ball, soccer players must pay attention to two important elements during training. First, it is necessary to position the support leg as close to the ball as possible and, second, maximize the force used in the initial phases of the kick to achieve a high speed of the kicking foot.

Arampatzis, Brüggemann, and Walsch, (1999):. The basic technique used in long jumping has remained unchanged since the beginning of modern athletics in the mid-nineteenth century. The athlete sprints down a runway, jumps up from a wooden take-off board, and flies through the air before landing in a pit of sand. A successful long jumper must, therefore, be a fast sprinter, have strong legs for jumping, and be sufficiently coordinated to perform the moderately complex take-off, flight, and landing maneuvers. The best women long jumpers achieve distances of about 6.5–7.5 m, whereas the best men (who are faster and stronger) reach about 8.0–9.0 m. The objectives in each phase of the jump are the same regardless of the athlete’s gender or ability. To produce the greatest possible jump distance the athlete must reach the end of the run-up with a large horizontal velocity and with the take-off foot placed accurately on the take-off board. During take-off the athlete attempts to generate a large vertical velocity while minimizing any loss of horizontal velocity, and in the flight phase the athlete must control the forward rotation that is produced at take-off and place their body in a suitable position for landing. During the landing the athlete should pass forward of the mark made by their feet without sitting back or otherwise decreasing the distance of the jump. This chapter presents a review of the most important biomechanical factors influencing technique and performance in the long jump. The biomechanical principles behind the successful execution of the run-up, take-off, flight, and landing phases of the jump are explained. The effects of changes in run-up velocity on the athlete's take-off technique are also examined, as are the design principles of long jump shoes and the techniques used by disabled athletes.

Nikša Đurović, Vinko Lozovina *et al*. (2008) [9]; the purpose of the study was to analyze "new biomechanical model for tennis serve" A sample of 70 professional ATP players was used to perform an analysis of serve in the game. Digital snapshots of the matches have been used for the purpose of analysis. Each player had 10 successfully performed serves analyzed. Sophisticated 3-D Motion Analysis System with accompanying Software was used within the analysis. The main goal of the work was to establish biomechanical regularities of the correct, orderly and effectively performed serve through 3-D analyses of the serve. The secondary goal was to establish the model that explains correct and biomechanically justified performance of the serve, which model could in the future be put into function of teaching young and perspective tennis players, as well as for technical tactical corrections of top players, at least for choosing tactics that involve serve. The established model is made up from 8 variables (A-H) and functions flawlessly while giving the opportunity to conclude and explain generally as well as specifically. The best technique of serve, and the goal of every player is to master it to perfection, will allow the complete control of performing this action with the least risk of injury. Significantly flexed knees to make Use of ground reaction Force (GRF) to begin the summation of Forces, Disturb balance – extend arm-hips Going forward, Shoulder begin to rotate away From the net, Internal rotation of the upper arm And forearm pronation, Hand flexion, Body lands inside the baseline with Trunk flexed forward, Left / right hip follows cg Trajectory, Cg always going forward.

Khan Asim, Husain Ikram *et al*. (2013) [13]; the pupose of the study "Effect of Different joints Velocity during Approach Run on High Jumping Performance: A Kinematic Study" This study was structured to detect whether the joints velocity during approach run has an impact on the jump height (performance). For the purpose of these study twelve male high jumpers who perform Fosbury-flop technique were recruited from the 70th All India Inter University Athletic Championship, Jawaharlal Nehru Stadium, Chennai, 2009. The mean age, height and body mass of high jumpers were 23.5 years (± 2.28 years), 179.90 cm (± 4.43 cm) and 66.78 kg (± 4.78 kg), respectively. Before data acquisition subjects were asked to go for complete warm-up and practice the Fosbury-flop technique. When subjects warmed-up they were asked to perform Fosbury-flop high jump technique. Each subjects jumps at an interval given by the experts of the event. For collecting the videographic data, a Sony DCR SX40E camcorder in a field setting operating at a nominal frame of 60 Hz and with a shutter speed of 1/2000 second was used. To acquire kinematical data during the competition the camcorder mounted at a height of 5 feet was placed at 10 meters away, perpendicular to the approach area. All subjects were performed three jumps, all the jump performances were recorded and downloaded in the personal computer and only successful jump performance of each subject was selected for further analysis. The digitization of the obtained data was done with the help of Silicon Coach Pro7 motion analysis software. The kinematical variables for the study were taken as ankle, knee, hip, shoulder and elbow joints velocity. All statistical procedures were conducted using the SPSS 16.0 Version software. A level of significance was set at 0.05. The correlation-coefficient was used to establish a relationship between biomechanical variables and jumping height (performance) of Fosbury-flop high jumpers. The results of the study revealed that there was significant relationship exist between ankle, hip, shoulder and elbow joint velocity with the jump height (performance) and insignificant relationship existed between knee joint velocity and jump height (performance). On the basis of the results it is concluded that during the approach run the velocity of the different joints affect the jump height (performance of the high jumpers).

Coh Milan, Supej Matej (2008) [12]; the purpose of the study was to identify the Key dynamic and kinematic parameters Of the take-off action in the high jump.The authors studied a single elite athlete (personal record 2.31m) using a direct measurement method, i.e. A force plate, to measure the dynamic parameters and a synchronised 3D video system to measure the kinematic parameters. They were able to collect and calculate data on 49 variables. Given that the study was focused on just one athlete, generalization of the results can only be limited. However, this was a very specific experiment where the results clearly have theoretical and practical value for biomechanical research of high jump Technique modelling. Their findings include that the jumper studied developed the highest ground reaction force in the eccentric phase of the take-off. The ground reaction force in the vertical direction exceeded his body weight by 5.6 times. In the concentric phase, the maximum ground reaction force was 9% lower than in the eccentric phase. They were also able to identify large ground reaction forces in the horizontal and lateral directions, which are manifested in extreme loading on the ankle joint of the jumper's take-off leg during the take-off action.

Jung Jae-Hu, Kim Dong-Soo *et al*. (2011) [13]; The purpose of this study was to analyze the kinematic variables for the women's javelin throw at the IAAF World Championships, Daegu 2011. Three-dimensional motion analyses of the eight players who qualified for the final round were carried out to obtain the data. The results showed that average release, attitude, and attack angles were 38.0±2.0°, 40.4±4.3°, and 3.7±1.1°, respectively. At the release, the average inclination angle of the trunk, upper arm, forearms were 60.8±8.3°, 47.3±10.1°, and 62.6±10.6°, respectively. Moreover, the release velocity and the release height results averaged 25.60±1.16 m/s and 1.86±0.05 m. The crossover phase and delivery phase had average distances of 1.88±0.31 m and 1.53±0.21 m. After release, the average distance between the landing foot and the foul line was 1.72±0.63 m.

## Methodology

This chapter includes selection of subjects and selection of biomechanical variables for the kinematic analysis of bunch start in track event.

**Selection of Subject**

Five male participants in from amity school of physical education and sports science, Noida has been represented National athletics has been taken photographed for skill "Bunch start"

After that following kinematic skill were analyzed for skill "Bunch start"

**Selection of kinematic variable**

1. Angle at various joints
2. Centre of gravity
3. Height of centre of gravity from ground
4. Location of centre of gravity within the base of support
5. Base of support

Reliability of Data: Cannon D50, 30fps with good resolution camera was used to make reliable data has been measured, the instruments which has been used for the purpose of the study, tripod stand, camera, steel tape and geometric instruments these all instrument are available in amity university (BJMC), Noida and the reliability has been ensured by the manufacturer. The photograph has been taken by professional photographer to ensure correctness and reliability.

**Photo Protocol**

Photographs have been taken with still camera cannon D50 and the height of camera was 1 meter from the ground and the distance from camera to starting block 5.79 meter to the camera the camera was set in sagittal plane. i.e. from the side the camera was set on the tripod stand so as to ensure the steadiness in photography.

**Procedure for mechanical analysis**

In the wake of acquiring the required photos, stick figures (Elgon's) were drawn from the photo utilizing the Joint Point Method and the focal point of gravity of everybody section and the entire body was controlled by the division technique proposed by Hay. The edges at different joints were likewise dictated by the technique. The stride shrewd examination which was done as takes after:-

On the photos the different joints were marked very carefully to be the reference point associated with each segment. By moving straight line between proper reference focuses Elgon or a stick figure was made for different phases of start.

The various joints were marked on the photograph as the reference point associated with each segment. "Elgon" or a stic figure was constructed by ruling straight line between appropriate reference points for moment stance of "on your mark" and "set". Of both the start bunch start and elongated start. After measuring the length of every section line it was separated into different lengths in the proportion as showed in the table the trunk line was obtained by joining the midpoint of the line between the right and left hip joints to the midpoint of the trunk at the level of the suprasternal notch. (if both the hip points are visible).

Two axes (OX & OY) were constructed, one below the stic figure and on the left of the stick figure. As that shown in appendix tables a form was prepared. In column the weight of segment recorded. For each of the segment perpendicular distance was measured from the Cg to the line OY, which was then entered in the appropriate place in the form (appendix table). Distance of its center of gravity from the line was multiplied by weight of each segment as given in table no.3, table 3 to find the moment about OY. By adding all the moment about OY the total sum of moment about OY was found.

At the distance of the total sum of moment about OX. A line OY was drawn parallel to OY. The centre of gravity of the whole body was somewhere on that line. For moment about OX the above steps was repeated from 5-9. The centre of gravity of subject was on O"X" which was drawn parallel to the OX and at the distance of the total sum of movement about OX. The point of intersection of the two line i.e. O'Y' and O'X' served as the centre of gravity of the body of subject of the angles athlete various joints were measured from the geometric instrument by the stick figure.

**Table 1**

| S. No | Segment | Relative Weight |
|---|---|---|
| 1. | Head | 0.073 |
| 2. | Trunk | 0.507 |
| 3. | Upper arm | 0.026 |
| 4. | Fore arm | 0.016 |
| 5. | Hand | 0.007 |
| 6. | Thigh | 0.103 |
| 7. | Calf | 0.043 |
| 8. | Foot | 0.015 |

**Weights of body segments relative to total body weight**

**Table 2:** Location of center of gravity of body segments

| S. No | Segments | C.G location expressed as percentage of total distance between reference point |
|---|---|---|
| 1. | Head | 46.4 % to vertex ;53.6% to chin-neck interest |
| 2. | Trunk | 38%to supra-sternal notch ;62% to hip axis |
| 3. | Upper arm | 51.3% to shoulder axis ;48.7% to elbow axis |
| 4. | Fore arm | 39% to elbow axis ; 61% to wrist axis |
| 5. | Hand | 82% to wrist axis; 18% to knuckle iii |
| 6. | Thigh | 37.2% to hip axis ; 62.8% to knee axis |
| 7. | Calf | 37.1% to knee axis ;62.9% to ankle axis |
| 8. | Foot | 44.9% of heel: 55.1%to tip of longest toe |

**Table 3**

| Segment | Segment wt. | Distance OX (cms) | Moments OX | Distance OY (cms) | Moments OY |
|---|---|---|---|---|---|
| Head | 0.073 | | | | |
| Trunk | 0.507 | | | | |
| upper arm | 0.026 | | | | |
| forearm | 0.016 | | | | |
| hand | 0.007 | | | | |
| Left thigh | 0.103 | | | | |
| Right thigh | 0.103 | | | | |
| Left calf | 0.043 | | | | |
| Right calf | 0.043 | | | | |
| Left foot | 0.015 | | | | |
| Right foot | 0.015 | | | | |

**Form for computation of center of gravity coordinates**

**Analysis of finding and interpretation of findings**

The finding of various kinematic variables such as angels at various joints. Base of support, position of center of gravity within base of support. The photographs of respective elgons of all the five participants are presented form, all the data's were drawn from their respective elgons of bunch start and elongated start at both the phases "on your mark" and "set" position.

The kinematic analysis of bunch start in respect of participant 1 has been explained as follow

**Fig 1:** participant 1

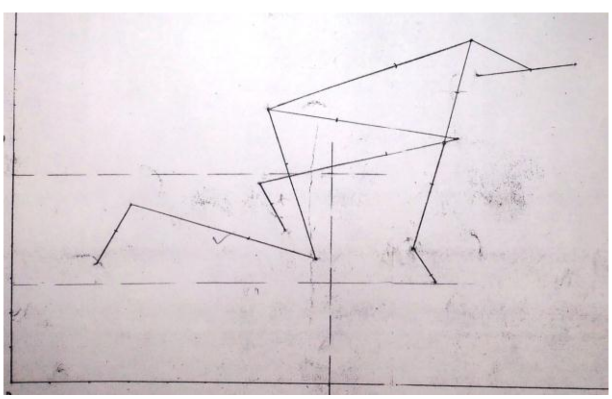

**Fig 2:** Elgon of participant 1

**Fig 3:** participant 1

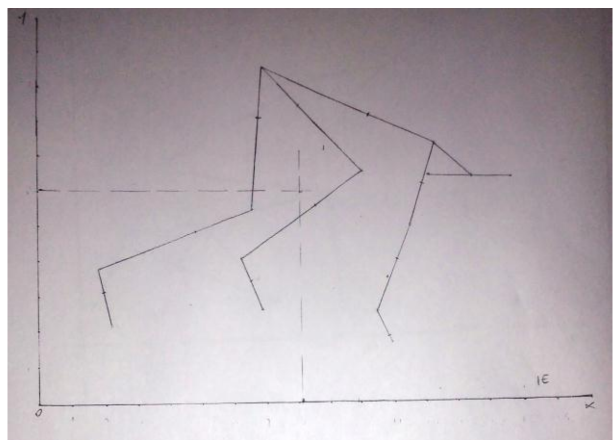

**Fig 4:** participant 1

Using the x and y coordinates of 14 segment of the body; the Cg was located with the help of segmentation method. The center of gravity has been shown in the figure 1 from the Elgon in fig.1 from the Elgon it is clear visible that Cg of the subject would lies within the base which reveals that he is stable with five touch point on the ground. The base of support increase due to five touch point on the ground keeping in mind the technical model of bunch set position in track event termed as good position in this position the starting block help in releasing the impulsive for which has been used in total amount in making the linear acceleration of arm and the position of the body will be straight in contact to base of support as per the technicalities of the skill. The kinematic analysis of bunch "set" position in respect to subject ONE.

**Analysis of data**

The relationship of various of various kinematic variables with the performance was found out by employing the Pearson's product moment correlation method.

**Summary, Conclusion & Recommendation**

**Summary**

The purpose of the study was to investigate the relationship of selected kinematic variable with the performance on sitting start of bunch start. The participants for the study were five male national level player athletics, amity university, Noida the age of the subject was 19-24 years.

Still photography was used to take the different phase of both the start "ON YOUR MARK" and "SET" these two phases were taken on both the start bunch start and elongated start. A cannon D50 was used (DSLR) were used in still photography on sagittal plane of the participant each participant were given two trails of bunch start (phase "on your mark and "set") and elongated start (phase "on your mark and "set") were taken and the best trail was used for the analysis. From the photographic sequence, the sticfigure were prepared by using joint point method, and the various angular kinematic variables were obtained at the moment stance and take off. Segmentation method was employed in order to assess the center of gravity of the body during "on your mark" and "set" position the data was analyzed by using Pearson's product moment correlation to ascertain the relationship of the selected kinematic variables with the performance of standing long jump of the subjects.

**Conclusions**

On the basis analysis and the analysis and within the limitation, the following conclusion was drawn:

1. The center of gravity of the participant "on your mark" position remains in the center.
2. The center of gravity of the participant shift forward on "set" position.
3. Due to shifting of center of gravity the "set" position is more unstable than the "on your mark" position.
4. There is an extension in the angle of participant on "set" position by which the centre of gravity height shift upward also causes of unstablility.

**Recommendation**

On the basis of conclusion drawn in this study, the following recommendation has been made:

- The result of this study will be helpful for analyzing other type of jumps
- These results may be helpful to the physical education teachers and coaches to evaluate the performance and to prepare the training plans accordingly.
- The similar studies may be conducted by using sophisticated equipment's and subjects of higher level, talking bigger sample and with greater number of variable.
- Similar studies may be undertaken to analysis other events of track-and-field athletics and other games and sport.

**Table 4:** Consolidated table of data on bio-mechanical variables

| S. No | Variables | Angle in degree/distance in cms | |
|---|---|---|---|
| | Angle at various joints | ON(E) | SET(E) |
| 1 | Angle of *left elbow* joint | 180 | 180 |
| 2 | Angle of right elbow joint | 180 | 180 |
| 3 | Angle of right shoulder joint | 80 | 106 |
| 4 | Anle of right shoulder joint | 80 | 106 |
| 5 | Angle of left hip joint | 24 | 11 |
| 6 | Angle of right hip joint | 82 | 53 |
| 7 | Angle of left knee | 50 | 87 |
| 8 | Angle of right knee | 40 | 91 |
| 9 | Angle of angle of left ankle | 90 | 110 |
| 10 | Angle of right ankle | 93 | 90 |
| 11 | Centre og gravity | 5 | 5.5 |
| 12 | Location of c.g whithin base of support (towards hand) | 3.1 | 2.6 |
| 13 | Base of support | 8.4 | 8.5 |

**Participant 1** Elongated (phase: "on your mark")

| Segment | Segment wt | Distance OX (cms) | Moment OX | Distance OY (cms) | Moment OY |
|---|---|---|---|---|---|
| Head | 0.073 | 13.5 | .98 | 6.3 | 0.46 |
| Trunk | 0.507 | 10.3 | 5.22 | 8.2 | 4.157 |
| upper arm | 0.026 | 11.9 | .309 | 6.25 | .162 |
| forearm | 0.016 | 11.1 | .177 | 4 | .064 |
| hand | 0.007 | 10.9 | .076 | 1.85 | .012 |
| Left thigh | 0.103 | 8.1 | .834 | 8.5 | .875 |
| Right thigh | 0.103 | 6.8 | .700 | 8.1 | .834 |
| Left calf | 0.043 | 8.6 | .37 | 3.5 | .150 |
| Right calf | 0.043 | 4.85 | .208 | 4.8 | .206 |
| Left foot | 0.015 | 6.6 | .099 | 3.5 | .052 |
| Right foot | 0.015 | 2 | .045 | 3.17 | .047 |
| | | | 9.018 | | 7.019 |

**Participant 1** Elongated (phase: "SET")

| Segment | Segment wt | Distance OX (cms) | Moment OX | Distance OY (cms) | Moment OY |
|---|---|---|---|---|---|
| Head | 0.073 | 13.7 | 1 | 9.1 | .66 |
| Trunk | 0.507 | 10 | 5.07 | 9.2 | 4.66 |
| upper arm | 0.026 | 11.7 | .30 | 8.4 | .21 |
| forearm | 0.016 | 11 | .18 | 5.7 | .91 |
| hand | 0.007 | 11 | .77 | 3.1 | .022 |
| Left thigh | 0.103 | 8.4 | .86 | 7.6 | .78 |
| Right thigh | 0.103 | 9.8 | 1 | 6.3 | .65 |
| Left calf | 0.043 | 7.1 | .30 | 6.5 | .28 |
| Right calf | 0.043 | 6.1 | .26 | 4.1 | .17 |
| Left foot | 0.015 | 6.7 | .1 | 5.1 | .076 |
| Right foot | 0.015 | 2.65 | .039 | 4.3 | .064 |
| | | | 9.879 | | 8.482 |

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