3 POINT REACTION BOARD

Introduction:

The aim of the experiment using the 3 point reaction board, is to be able to work out the where the centre of gravity is on a subject during a physical activity. The 3 point reaction board is quite accurate as it works out the position of the centre of gravity from two dimensions. This type of analysis as Hay describes 'has been become of significant use in many years, due to being able to find the centre of gravity during an activity and enhancing the ability to analyse sporting techniques'(1993). There has been many different methods used to try and find the centre of gravity although the 3 point reaction bard has proved to be one of the best. It is accurate, but can still only give an estimate as the centre of gravity changes for every breath or slight movement made, although it does allow an indication.

There is a method called the reaction board, which is the simplest. It is very similar to the 3 point reaction although it only has one dimension the equation is the same. The 3 point reaction board is more accurate, because the it takes two measurement using the same equation twice from each dimension.

Being able to calculate the centre of gravity can have a significant benefit on the performance of many sports. This is evident to see in jumping events where the need to be able to control the centre of gravity to produce the required height as in high jump or distance in long and triple jump.

Method:

- Once the 3 point reaction board had been laid done, the next decision was to decide the sides in which the measurement are to be taken.
- The decision was made that measurements were taken between points A-B and C-B, which were measured in length.
- Fulcrum was found, therefore two scales were put at points A and C, a wooden block was used to try and make the board level. The results from the scales were recorded.
- The decision next was to decide on what type of athlete and area was going to be used. The decision was made, using a runner and the end of an individual long or triple jump.
- The subjects were on an over head and focussed on to the reaction, to become size of reality and then draw the out of the subject.
- The same was carried out for each position. Position one was a subject taking-off for a long jump and position two was a subject preparing to land in the pit.

Results:

Once the experiment had been carried out the results where gain and used in a formula to calculate the subjects centre of gravity.

AB	=	X	Scales	C	R_1 33.5,	R_2	74	62
CB	=	Y	Scales	A	R_1 22,5,	R_2	41	53

Position 1

$$\chi = \frac{(74 - 33.5)}{80} 2.01 = 1.02\text{m}$$

$$\gamma = \frac{(41 - 22.5)}{80} 2.01 = 0.46\text{m}$$

Position 2

$$\chi = \frac{(62 - 33.5)}{80} 2.01 = 0.72\text{m}$$

$$\gamma = \frac{(53 - 22.5)}{80} 2.01 = 0.77\text{m}$$

The results showed that the more upright position the body is in the higher the centre of gravity. Position 1 is 1.02 metres high where position 2 is only 0.72 metres high due to the more low sitting position in the air.

Discussion:

The result of where the two lines meet from each dimension are very direct as there are no other results gained to compare the result with, therefore a it is hard to discuss the findings.

The practical was carried out well, although there were many thoughts that could have effected the results that were gained. The board did not seem to be laying straight which could have effected the readings in the final stages. Drawing the subject from the over head projector was drawn free hand which is open to human error. The size of the image was not quite in proportion to the subject carrying out the practical, which could effect the findings, as the centre of gravity will be different depending on the size of the subject. Some of the readings from the scales were a little out of the 'norm' this could be due to the unevenness of the reaction board. Another and most apparent error was the human error of the subject moving slightly during the readings as well as breathing, which changes the formation of the mass of the body.

This is where the centre of gravity is on majority of people, but when the position of the body changes so does the centre of gravity. Being able to find the centre of gravity during many different positions can be very useful. When a subject carries out a long jump the centre of gravity changes depending on the position of the body.

Fig. 1

If the subject were to transform the position of the body in the air the subject would be able to continue to travel further in the air. This due to the findings of the experiment that being able to transform into a sitting position in the air the centre of gravity moves to the front of the body or even out side of the body to cause forward momentum.

Fig. 2

Reference List:

- Hay, J (1993) *The Biomechanics of Sports Techniques.* Prentice-Hall Inc. New Jersey.
- Hochmuth, G. (1984) *Biomechanics of Athletics Movement*. Sportverlag, Berlin.