eTwinning	TEAM: purple team	
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EXPERIMENT: examine the changing velocity of a volleyball while slamming it in		
different ways		

## 1. ORIENTATION

### 1.1. Research question:

How does the velocity and trajectory of a volleyball change when the volleyball is served in different ways with a constant hit.

### Sub-questions:

- How does the velocity and trajectory change when you do a basic overhand serve?
- How does the velocity and trajectory change when you do a basic underhand serve ?
- How does the velocity and trajectory change when you jump while serving the ball (overhand)?

### 1.2. Hypothesis

- With a basic overhand serve the volleyball gets a bigger velocity than with a basic underhand serve, because the ball goes straighter and the force of the server has the same direction as the track of the ball. With an underhand serve, the volleyball makes a bow which reduces his velocity.
- A take-off or a jump have also a positive influence on the velocity because it increases the force of the player.

### 2. PREPARATION

- 2.1. Material:
  - a volleyball
  - one or more players
  - a phone or camera
  - tracker
  - tape
  - a ruler

#### 2.2. Method:

- First of all stick two strips of tape on the wall in front of which you will drop the ball. Measure the distance between these strips and memorize it. Further information of the tracker is on the twin space.
- Now we need just one person. This person will slam the ball in three different ways. (sub-questions!)
- Film each serve with a phone or camera so that we can examine then later with tracker. Make sure that the whole track of the ball is on the small film.
- Do a basic overhand serve, a basic underhand serve and a serve with a jump.

- After the tests we will calculate the velocity of the ball in each way and compare them with each other.
- Post the films on the drive.

### 3. DATA ANALYSIS and DISCUSSION

#### 3.1. Observations and Measurements:

#### Italian experiment n°1 analysed by French







#### Italian experiment n°2 analysed by French

#### 3.2. Discussion:

a. We see a lot of differences in our results and those of the french. we can remark in the results, that the students have measured the height in function of the time as you can clearly see in the graphs.the first pink graph is the speed in fonction of the time and the derivative of the place-graph. The second pink graph gives us a view of the

0,6 t

0,7

▼ Test de tendance..

0,8

0,9

A

B

1,0 1 Paramètre

0,5

2

Valeur

non éditable

-1,461E1

8,006E0

-3 -4 -5

-6

0

0,1

Nom de la courbe de tendance: Droite

0,2

Équation de la courbe de tendance: vy = A\*t + B

0,3

0,4

Courbe de tendance automatique déviation associée à la moyenne quadratique (rms): 1

high slam and the changing of place in fonction of the time. in the blue graphs they have done almost the same, but they used the video of a low slam, what gives us a clearly parabolic graph. (made by the belgians of the french videos)

b. Discussion by French on Italian analysis of Belgian experiments

### 4. REFLECTION

### 4.1. Conclusion:

there graphs are as correct as can be, because the trendline is the same as there graph. That means they did a good job.

From the graphs we can see that the hypothesis is correct and that the experiment is well done. (made by the belgians of the french videos)

### 4.2. Comparison:

4.3.

### 4.4. Reflection:

# **High hand:**

# X(t)=5.859x<sup>2</sup> -1.018x- 2.564



 $V(t) = -1.114x^2 + 1.734x - 1.074$ 



Low hand:

X(t)=4.228x<sup>2</sup>-8.328x-2.914



# $V(t) = 8.03.10^2 t - 8.69.10^2$



# Jump:

Experiment

X(t)=6.305x<sup>2</sup>-1.080x-1.315



# V(t)=8.911x - 8.932



### 5. REFERENCES

Experiment