ACTIVITY TITLE: SPRINTLAB

Activity code: ncAIJU01

DURATION	120 minutes
AGE RANGE	15 – 16 y/o
TOPICS	Biomechanics Movement Health STEAM

Description of the project

The activity *'SprintLab: How does your body influence your speed?'* aims for students to explore the relationship between their physical characteristics and performance in a 100-metre race. Through a practical and collaborative experience, students will measure their own biometric data (such as height, weight and leg length), run a timed race, analyse the number and cadence of their strides, and graph the results obtained.

At the beginning of the activity, a Kahoot related to the activity will be prepared, with questions such as:

- Do you know what anthropometric data is?
- What factors do you think affect human speed (weight, height, stride, leg length)?
- What is the world record in the 100m race (put a figure for the fastest man and woman in the world)?
- Do you think athletes and coaches use science to improve their performance? In which areas? (Nutrition, strength exercises, speed exercises, none, all are correct…)
- Do you know any women involved in sports technology?
- Who is Florence Griffith-Joyner?
- *Did you know that…* Tiffany Beers is an engineer who worked for Nike and led the creation of the self-lacing shoes inspired by Back to the Future — the Nike Mag.

During the session, we will work on key concepts related to the biomechanics of human movement, average speed, cadence and stride length, as well as the representation of data through graphs. Critical reflection on how different physical characteristics influence sporting performance will also be encouraged, from an inclusive and scientific approach.

For anthropometric measurements, the teacher with each of the pupils will take the measurements individually. The child will be the one to record the data in the individual template and the teacher will include them in the joint template anonymously using a system of codes to avoid embarrassment and comments from some of the pupils. In the case that they occur, the activity will be stopped, and concepts such as body acceptance and bullying/harassment will be worked on.

The students will take non-anthropometric measurements such as stride length and the time taken to run 60/100 meters.

At the end of the activity, students are expected to be able to interpret comparative graphs, understand the relationship between body variables and speed, and present their conclusions in a visual and argued. way. Optionally, teams can design a prototype of an optimised shoe based on the results obtained.

Objectives: What will I learn?

- **Identify, understand and record personal biometric data** (height, weight and leg length) by using basic measuring tools accurately and responsibly in order to analyze how physical traits relate to movement and develop responsible data practices.
- **Determine the total number of strides and cadence** (strides per second) during sprinting, by using direct observation and/or video recording analysis during a 100-meter race to explore how these movement metrics impact speed and athletic efficiency.
- **Graph the relationship between physical variables** (height, weight, leg length) **and sprint performance** (average speed), by using spreadsheets or digital graphing tools in order to learn to visualize and interpret real data scientifically and clearly.
- **Analyze and interpret** comparative graphs of biometric and performance data using variables such as height, weight, and leg length in relation to speed and stride, to draw evidence-based conclusions about how body diversity influences athletic performance and to foster critical and scientific thinking.
- **Work cooperatively** in data collection, analysis of results and communication of conclusions, by respecting bodily diversity and promoting equal participation in the group to promote teamwork, equitable engagement, and respect for physical diversity in sports contexts.

Materials: What do I need?

1. **Provided by the teacher/institution:**

- Flexible tape measure (to measure height and leg length).
- Digital scales (to record the weight of each participant).

- Manual stopwatches or mobile timing application (one per group).
- Cones or markers to mark out the 100-metre course.
- Adequate physical space for the sprint (track, playground or flat area).

2. **Provided by students:**

- Notebook with hard cover to be able to take data while standing up.
- Pen or pencil.
- Clothing and footwear suitable for physical activity.

3. **Downloadable resources:**

- Template for recording biometric data and timing.
- Step-by-step guide with instructions and calculations.
- Example of graphical representation in spreadsheet (Google Sheets).
- Template for creative shoe design (.pdf or editable format).

Previous preparation

- **Organise students** into mixed groups of 3 to 4 people, ensuring gender balance and diversity of roles.
- **Ensure the availability** and set-up of the sprint area (100 metres marked with cones or other markings). Check the functioning of stopwatches or mobile apps.
- **Check that the software or application for charting is operational** (e.g. Google Sheets, Numbers or Excel). If using Google Drive, check access in advance.
- **Print the biometric data collection** and timing templates or distribute them in editable digital format (PDF or Google Docs, as appropriate).
- **Instruct students** to bring appropriate sports clothing for the race, as well as their personal materials (notebook, pencil, device, if required).

RESEARCH

Have a look at these resources

Why is it important to know how our body influences our speed?

Each person has unique body characteristics: height, weight, leg length, stride type... All these factors directly influence how we move, our running efficiency, and particularly our speed. Biomechanics is a science that studies how the body performs movement, and has direct applications in sports performance, shoe design, injury prevention and general health.

This activity allows students to discover, through their own bodies and by analysing real data, how these physical variables affect performance in a 100-metre race. At the same time, it encourages the use of technological and mathematical tools to interpret results, develop conclusions and propose creative solutions.

Real-world examples

- At the Olympic Games and world championships, coaches and biomechanists analyse the stride, cadence and force applied by athletes to optimise their performance.
- Companies such as Nike and Adidas use anthropometric data and stride analysis to design customised shoes for each type of athlete.
- Athletes such as Shelly-Ann Fraser-Pryce or Usain Bolt have been extensively studied for the relationship between their physical characteristics and their exceptional performance in the 100 metres.

Key Questions to discuss

- How does the length of your legs influence the length of your stride?
- Is it more important to take more steps per second or to take longer strides?
- What advantages and disadvantages can a person with a higher body weight have when running?
- Do you think all bodies are equally represented in elite sport?

CREATE

Some things you need before beginning

Interesting facts:

- **The average speed in a race does not depend on strength alone**: Speed is a combination of stride length and cadence (number of steps per second). People with longer legs do not always run faster: if the cadence is low, their performance may be lower than someone with shorter but faster strides may.
- **Everybody moves differently:** Biomechanics studies how physical characteristics influence the way you run. Factors such as flexibility, muscle strength, hip alignment and even stride type can influence the efficiency of movement.
- **The relationship with footwear is key:** The design of a shoe can improve traction, absorb impact, reduce injuries and optimise momentum. This is why many sports brands develop specific prototypes for different disciplines and body types.

- **Data analysis is used in professional sports:** Today, coaches and trainers use digital tools to measure their athletes' performance: speed, heart rate, reaction times, and even movement patterns with sensors or high-speed cameras.
- **Applications in everyday life:** Understanding how your body moves helps you play sport more safely and efficiently, prevent injuries, better choose the shoes you wear, and make healthy choices based on knowledge rather than stereotypes.

Now, follow these steps

Step 1. Presentation of the activity:

- Explain to the group what SprintLab is about: analysing how each person's physical characteristics influence their performance in a 100m race.
- Show pictures or short videos of athletes (ideally diverse) and ask questions such as:
  - What do you think influences running fast more: strength, technique or body shape?
  - Will a tall and short person have the same cadence?
- Research the biometric data of a sprinter, a marathon runner, a swimmer, rhythmic gymnastics, weightlifting (in all cases examples of men and women. Aspirational people in each case) and compare it, in order to understand the body differences and similarities by sport.

2. Group formation (5 min):

- Divide students into mixed groups of 3-4 people. Assign or allow them to choose roles:
  - Timekeeper
  - Stride observer
  - Runner
  - Responsible for recording data

3. Biometric data measurement (15 min):

- Each group measures and records each participant:
  - Total height (from the ground to the crown of the head).
  - Weight (with sports clothes and trainers).
  - Leg length (from iliac crest to ankle).

- All data are recorded on a template or spreadsheet.
- Hours of intense sport per week
- If it is possible to perform, the activity on various types of pavement and compare results.
- If it were going to be done several times during the school year, it would also be interesting to note down the weather conditions.
- Type of sport

4. **Timed 100-metre race (20 min):**
   - In the prepared space, each participant will run 100m:
     - One partner will time the exact time (with app or stopwatch).
     - Another will count the total number of strides taken.
     - Two attempts can be made to obtain the best time.

Tip: Record the race on video to check the stride if necessary. In a sandy area, measure the mark and then smooth out.

5. **Calculation of key variables (15 min):**
   - Each group will calculate:
     - Average speed = distance / time (100 m ÷ seconds).
     - Cadence = strides ÷ time (strides per second).
     - Average stride length = distance / number of strides.

Tip: Record all values in the table.

6. **Graphical representation of the results (15-20 min):**
   - With tools like Google Sheets or Excel, create:
     - Graph 1: Height vs speed
     - Graph 2: Weight vs speed
     - Graph 3: Leg length vs speed

Tip: Use clear colors and labels. Include title, axes and legend.

7. **Analysis and reflection (15 min):**
   - Groups compare graphs and respond aloud or in writing:
     - Which variable influences speed the most?
     - Is there a direct relationship between height and performance?
     - Are there any conclusions that surprised you?

- How does body diversity influence sport?

8. **Gamification and creative design (20 min):**

- Reward the group that makes the most complete and visually clear analysis (not the fastest).

9. **Reflection on the Social Impact of Sport (10 minutes)**

- How can sport contribute to a healthier and more just society?
- What social barriers prevent people from practising sports equally?
- Do you think your community (school, neighbourhood, city) promotes physical activity equally for everyone?
- How could you use what you've learned today to promote health and inclusion in your community?

10. **Artistic Reflection: Redesigning the Message of the Body in Sport (20 minutes)**

- Each group will design a poster, infographic, or digital artwork that conveys a clear message of body positivity and inclusion in sport. This task is no longer optional and will be part of the final presentation.

- The artwork must include:

  - A creative slogan (e.g., "My body, my pace", "Fast doesn't have one shape", "Every body is a sports body").
  - A visual design that contrasts traditional athlete images with diverse body types.
  - A short critical reflection (2–3 sentences) on how the body is traditionally represented in sport and what alternative message the group proposes.

COMMUNICATE

This is the moment for students to show and argue what they have worked on. Each group will have a set amount of time (e.g. 5-7 minutes) to present their data analysis.

- Explanation of the data analysis:
  - Show the graphs generated (height vs. speed, weight vs. speed, etc.).
  - Explain how these data were interpreted: What conclusions did you draw about body and speed?
- **Final reflection aloud (individual or group):**
  - What have you learned about your own body and about physical diversity?
  - How does technology and data analysis influence sport?
  - How could we make sport more accessible and inclusive?

It is time to share!

In this section different social media will be presented in order to upload their activity result.

#nameoftheactivity

- LinkedIn: https://www.linkedin.com/company/steambrace-project/posts/?feedView=all
- Instagram: https://www.instagram.com/steambrace_eu/
- X: https://www.instagram.com/steambrace_eu/

KEEP ON LEARNING

How can I make a similar project by myself?

Reflection Questions:

On practical experience:

- What was the most difficult part of measuring and analysing the data?
- Were you surprised by your own or your classmates' speed results? Why?
- Did you learn anything new about your body or your physical abilities?

About the data analysis:

- What was the clearest relationship between physical variables and speed?
- Do you think the data would have changed if we did more runs or if we changed the conditions (surface, weather, shoes)?
- What would you improve in your analysis if you had more time or more advanced tools?

About the connection with real life:

- Would you like to do something related to biomechanics, sport, health or design in the future? Why?
- Could you apply what you have learned in this project to solve other types of problems? Which ones?
- Why do you think this kind of analysis can be important in today's society?

Which are other connected projects?

- **Compare with real athletes:**
  - Choose two sprinters (male and female) and research their height, weight, stride, average speed.
  - Create a presentation where you compare them with yourself and draw conclusions:
  - What do you have in common?
  - What is the difference in performance?
- **Create an 'Every body can run' campaign.**
  - Design an infographic, digital poster or mural that shows how different body types can excel in sport.
  - Use SprintLab data to create meaningful visual messages: for example, 'Short legs make me fast too' or 'My body, my pace'.
- **Create an interactive quiz**
  - Using an app such as Google Forms or Genially, design a short quiz:
  - 'What kind of runner are you?'
  - The quiz can include questions about height, energy, perceived speed... and at the end suggest a type of training or personalised shoe - you can even include a brand design of your own!

LINKS FOR FURTHER INFORMATION

- https://worldathletics.org – **World Athletics web page**
- https://www.olympics.com/es/ - **Olympics web page**

Disclaimer