# Footprints In the Sand
## Activity 2D

### Activity Objectives:
**Students will be able to:**
- ▼ work in a collaborative group with assigned roles to complete a given task
- ▼ examine the various parts of the gait cycle through an interactive lab
- ▼ report their findings using charts, graphs, and simple calculations
- ▼ measure foot angle and calculate mean, median, mode

### Activity Description:
While performing the lab, students will observe different characteristics of the gait cycle by measuring and calculating the following: **base of support**, **line of progression**, and **foot angle**. Students will take this information and use it to determine the **mean**, **mode**, **median**, and **range of values** within their group and for the entire class. This lab uses most of the materials from *Gauge Your Gait*.

### Activity Background:
Whether you strut, stroll, or stumble, you have probably noticed that a person's walk is as unique as their personality. The underlying reason for these differences can be determined by examining certain aspects of a person's gait. The term gait refers to an individual's style or manner of walking. Detailed gait analysis involves determining factors such as a person's line of progression, base of support, and foot angle. These parameters are commonly studied in laboratories by means of sophisticated devices consisting of transducers, computers, high-speed film, and electromyographic machines. However, they can also be easily measured in the classroom by using a meter stick, protractor, dark paper, and talcum powder. By examining these parameters, students will understand how such variations can create very different movements. This type of gait analysis is also an important tool in determining a person's balance and overall mobility, therefore, doctors routinely use these parameters in order to effectively care for their patients.

### Gait Parameter Definitions:
- ● **Base of Support** is the distance between parallel lines intersecting the midpoint of each heel print.

- ● **Line of Progression** is a line located approximately at the center point between both feet along the walker's path of progression.

**Activity Overview**

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- **Foot Angle** is the angle formed by the intersection of the line of progression and a second line, which is drawn through the midpoint of the heel and the space between the second and third tarsal.
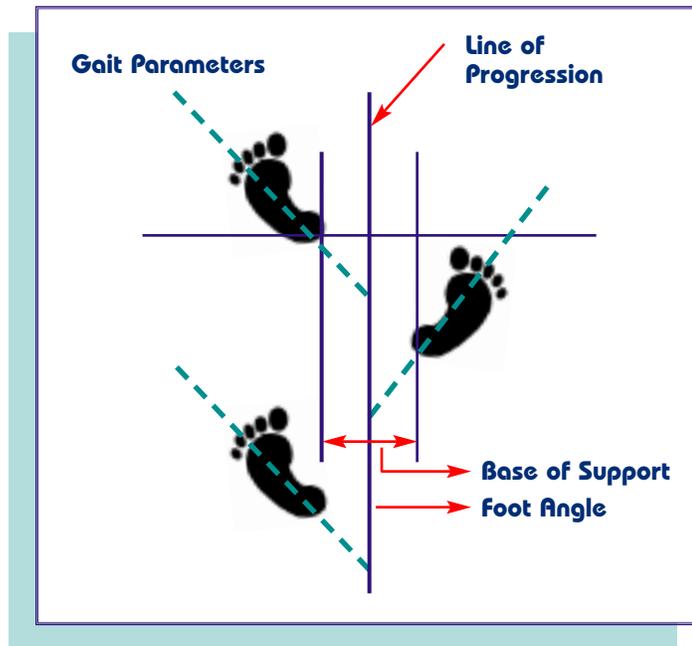


**Figure 1**

In addition to measuring the gait parameters listed above, students will also be asked to calculate the following mathematical values for their individual groups as well as for the entire class.

Mathematical values to be calculated by students:

- **Mean:**
  The mean of a collection of numbers is their arithmetic average, computed by adding them up and dividing by their number.
- **Median:**
  The middle value of a set of values.
- **Mode:**
  The most frequently occurring value of a group of values.
- **Range:**
  The set of all values, from lowest to highest

## Activity Materials: (per group)

- 2 meters dark colored butcher paper
- Talcum powder to fill a shallow tray
- Shallow tray
- Masking tape
- Protractor
- Meter stick
- Calculator
- Copy of *Student Activity Page*
- 1 copy of *Student Data Page for each student*

## Activity Management Suggestions:

Have students work in groups of 4 to complete the activity. You may wish to review the mathematical concepts that are necessary to complete the lab calculations.

**MODIFICATIONS:** For students needing more assistance:  Group these students with peers who can assist them during the lab. Check often for understanding.

For highly able students: Allow these students to work on the extension activity following the lab. Students may also be grouped with other students to provide peer assistance.

## Extension:

Students can perform the *Footprints in the Sand Inquiry* activity.

## Activity References Used:

Krebs, D.E., Goldvasser, D., Lockert, J.D., Portne, L.G., Gill-Body, K.M. (2002). Is base of support greater in unsteady gait? Physical Therapy 82(2), 138-147.

Whittle, Michael. (1991). Gait Analysis An Introduction. Oxford: Butterworth-Heinemann Ltd.

Nawata, K., Nishihara, S., Hayashi, I., and Teshima, R. (2005). Plantar pressure distribution during gait in athletes with functional instability of the ankle joint: preliminary report. Journal of Orthopaedic Science, (10), 298-301.

## Website used:

http://www.smpp.nwu.edu/~jim/kinesiology/partA_introGait.ppt.pdf

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LESSON 2
ACTIVITY 2D