



**University of Al Mustaqbal**  
**Biomedical Engineering Department**



**Biomechanics Design Lab**

**Dr. Ameen M. Al-Juboori**

---

---

Experiment # 3

**Foot Plantar Pressure (Static Test)**

**Introduction: -**

Measurements of plantar pressure provide an indication of foot and ankle function during gait and other functional activities, because the foot and ankle provide both the necessary support and flexibility for weight bearing and weight shifting while performing these activities. Although plantar pressure data have been recognized as an important element in the assessment of clients with diabetes and peripheral neuropathy, information derived from plantar pressure data also can assist in determining and managing the impairments associated with various musculoskeletal, integumentary, and neurological disorders.

Data obtained from a plantar pressure assessment can be used for the evaluation and management of patients with a wide variety of foot impairments associated with neurological and musculoskeletal disorders, which can affect both adult and pediatric patients. The assessment of plantar pressures can be included as part of a full laboratory gait analysis, or it can be done independently in either a laboratory or a clinical setting to help direct treatment options and for patient education. When plantar pressure values are determined to be atypical, the information can be used to modify a patient's management program through alterations in footwear, foot orthoses, exercise programs, and restrictions in the amount of weight bearing.

Information obtained from pressure systems is also useful from a research perspective to address many questions regarding the relationship between plantar pressure and lower-extremity posture. Because standing and walking are not the only activities in which plantar pressures are generated, investigators have compared various aerobic, dance, and



**University of Al Mustaqbal**  
**Biomedical Engineering Department**



**Biomechanics Design Lab**

**Dr. Ameen M. Al-Juboori**

---

---

functional activities with level walking to provide insight into the stresses that these activities impart to the foot and lower extremity.

The typical components of a system used to measure plantar pressures include the measuring device, which consists of sensors in a platform or insole configuration; a computer for data acquisition, storage, and retrieval for analysis; and a monitor for displaying data. Various software packages are available that allow the clinician to divide the plantar surface of the foot into numerous regions to permit the analysis of data, as is illustrated in Figure 1. The most common variables of interest include peak and average pressure, force, and area. Peak pressure plots represent the highest pressure value recorded by each sensor over the entire stance phase. Figure 2 depicts a peak pressure matrix obtained during walking for a child with juvenile rheumatoid arthritis (left) and a child of similar age without known pathology (right).

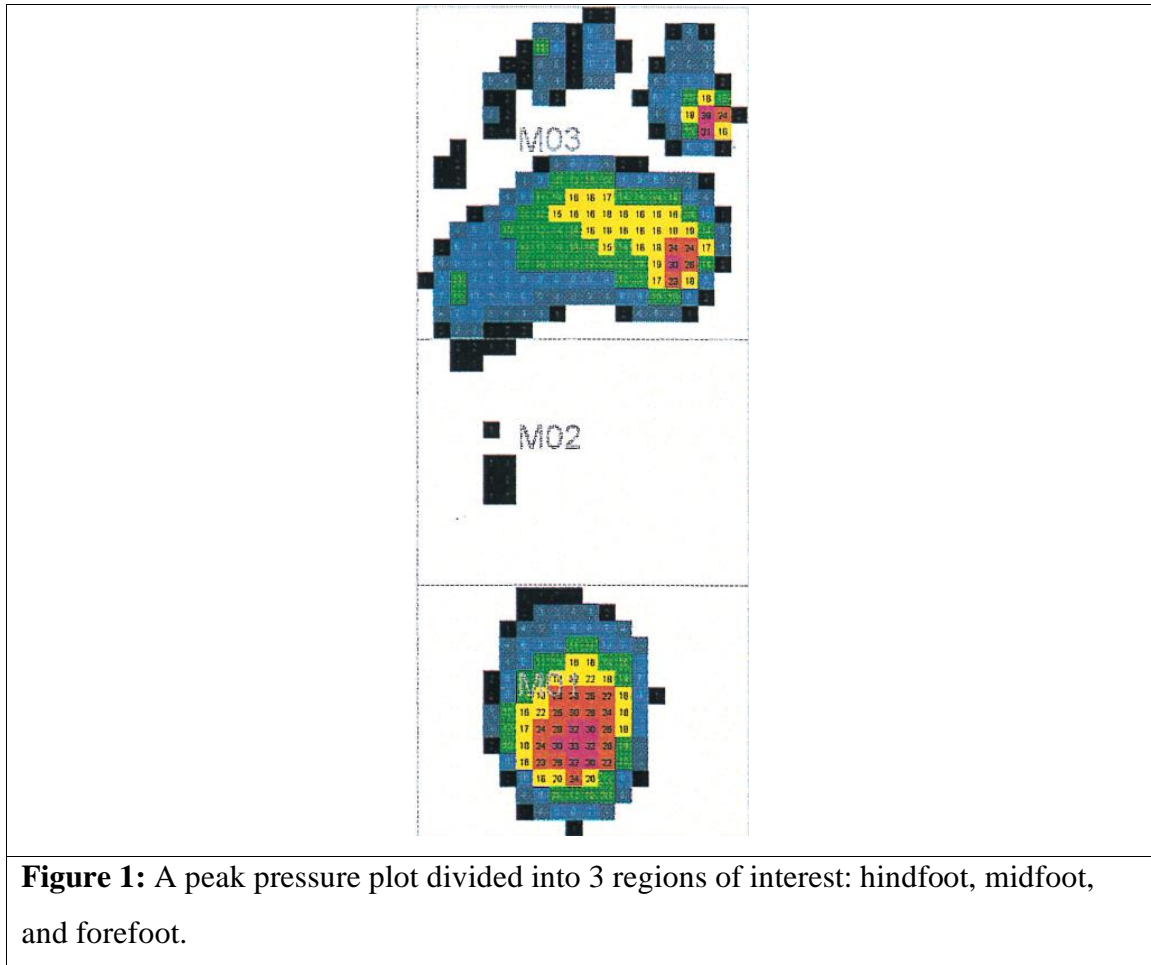


University of Al Mustaqbal  
Biomedical Engineering Department



Biomechanics Design Lab

Dr. Ameen M. Al-Juboori



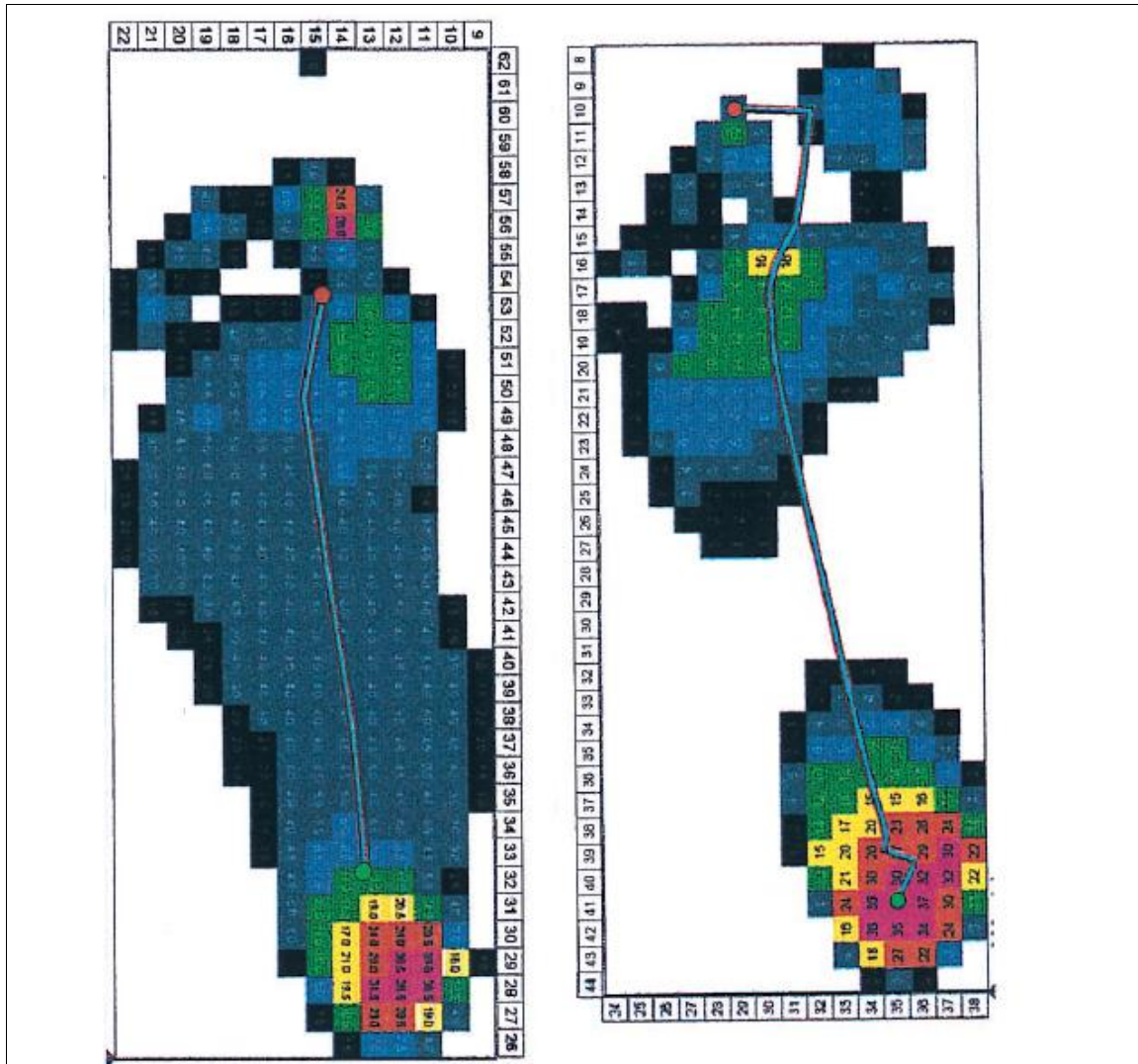


University of Al Mustaqbal  
Biomedical Engineering Department



Biomechanics Design Lab

Dr. Ameen M. Al-Juboori



**Figure 2:** Peak pressure plots for 2 children of similar ages. Left plot is from a child with juvenile rheumatoid arthritis, and right plot is from a child without known pathology.

**Experiment Objective: -**

1. The student become familiar with the pressure distribution on sole of the foot.



**University of Al Mustaqbal**  
**Biomedical Engineering Department**



**Biomechanics Design Lab**

**Dr. Ameen M. Al-Juboori**

2. Evaluation of the barycenter and the center of pressure of the 2 feet.
3. Identification of the max pressure points.
4. Identify the type of the foot.

**Apparatus: -**

1. Laptop.
2. Biomech studio Software.
3. Foot plantar pressure platform.

**Procedure: -**

1. Connect the foot plantar pressure platform to the PC.
2. Turn on the foot plantar pressure platform.
3. Start Biomech Studio.
4. Create new database under the name BME5.
5. Create new analysis (choose static).
6. Ask the test subject to stand still on the platform on designated marks.
7. The test subject should stand upright looking at an imaginary point on the wall.
8. Start data acquisition for 5 seconds.
9. Repeat the items 5-8 for the remaining four test subject.

**Data Analysis: -**

Fill the table below with required information

Test subject	Foot	Max pressure	Average pressure	Surface area	Arch Index
1	Left				
	right				
2	Left				
	right				
3	Left				



**University of Al Mustaqbal**  
**Biomedical Engineering Department**



**Biomechanics Design Lab**

**Dr. Ameen M. Al-Juboori**

---

---

	right				
4	Left				
	right				

**Discussion:-**

1. What is the relationship between Arch Index and the surface area?
2. What is the relationship between Arch Index and foot plantar pressure?
3. Evaluate the maximum oscillation in the lateral direction for the feet and the body?
4. Evaluate the maximum oscillation in the posterior- interior direction for the feet and the body?
5. Discuss the relationship between the
6. What are the factors effecting the foot plantar pressure?
7. Dose the terrain effect the foot plantar pressure? Explain how?
8. List the clinical and practical application of the foot plantar pressure?
9. Explain how the Surface area effect the barycenter of the feet?
10. Explain how the barycenter of the feet effect the location of barycenter of the body?