PARAMETERS THAT AFFECT ANKLE SPRAINS

**Limited Movement**
While on an aircraft, limited space, and physical activity over the extended period can result in restricted blood circulation to extremities [3]. Low blood flow results in lower oxygen delivery to tissues, which can lead to tissue hypoxia and affect the recovery process [1].

**Temperature**
Moist heat around the ankle is required for treatment after the initial inflammation phase of ankle sprains [9]. Cabin temperature ranges from 65 - 75 degrees Fahrenheit which is below heat pack temperature of between 140 - 160 degrees Fahrenheit [6].

**Posture**
Sitting down for long periods reduces circulation and blood tends to pool at the ankles due to gravity. The need for elevated legs is not always possible, and the ankle does not get the elevation it requires right after injury to reduce swelling, pain, inflammation and slows the process of healing [7].

**Sleep**
Sleeping on the back, side, stomach or in the fetal position are considered the best positions to provide good quality sleep which an aircraft does not provide [8]. Cabin noise contributes to disturbance as well. Adequate sleep is important for recovery from any sort of injury [9].

**Nutrition**
Recovery nutrition is essential for humans to rebuild cells which assists in recovery of ankle sprains[10]. Athletes require preplanned diet and more food energy than the average human in addition to maintaining recovery nutrition. Aircrafts limit access to extensive dietary requirements [11]. Poor nutrition can lead to increased risk of injury as well [12].

**Parameters With Negligible Effect**
- **Pressure, Carbon Dioxide & Oxygen**
  Although the pressure is slightly lower in aircrafts, the difference is too little to be of any biological concern. Carbon dioxide levels do not exceed 1500ppm in airplanes and prolonged exposure at levels up to 5000ppm has no known biological effect. Oxygen consumption per passenger is 0.36% of the oxygen provided [13].

**HYPOTHETICAL TESTING**
In the future, an experiment can be performed to validate the parameters that affect ankle sprains during flight. The eight parameters, such as temperature, that have been investigated could be measured before, during, and after flight. While measuring the parameters, the ankle will be analyzed. It is important that only one variable changes at a time to determine its effect. One possible way to analyze the ankle will be to measure range of motion with a goniometer, see Figure 2. In addition, the ankle’s circumference can be measured to determine how swollen the ankle is. Out of the eight parameters that has been investigated, five of them had an effect. However, all parameters should be tested to better validate the effect of the parameters. If the hydration level was decreasing throughout the flight, but no change in the measurement, it can be determined that hydration is not a contributing factor.

**REFERENCES**
[7] “Sleeping on the back, side, stomach or in the fetal position are considered the best positions to provide good quality sleep which an aircraft does not provide.” Reference: https://www.ncbi.nlm.nih.gov/pubmed/18381472