A Step Towards Solving Foot Pain: A Revolutionary Shoe with Magnetic Levitation to Reduce Ground Reaction Force

Lochan, Dev (School: Cumberland Valley High School)

216,262,500. That’s the number of steps an average human takes over their lifetime, yet the shoes that humans use to take those steps have not evolved over time and are found to have major flaws causing severe foot pain. My project is about designing and developing the first of a kind shoe with Magnetic Levitation that could change shoes as we know them. The new magnetic levitation shoe solves the problems of joint pain using a generic, less expensive shoe with supplemental technology. As part of my design, I added magnets between small pockets in 3 strategic areas of the sole and the insole according to a layout determined through clinical gait data, medical research, and consultations with 5 different doctors. The levitation's efficiency was then compared to the current technology through a set of rigorous testing using a crutch (simulated leg), 32 kg of weight which is an average weight of a normal leg, and an accelerometer to measure the deceleration of the foot. The deceleration is a measure of the efficiency of the cushioning and a lower number indicates a lower force. After over 120 trials, 4 different shoes, 198 data points, the modified shoe was found 19% more efficient in walking, 65% cheaper and 11% lighter than an average unmodified shoe. The results show that this is an invention that can change the rapidly growing $246.07 billion footwear industry forever and revolutionize a necessity in our life: shoes.