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Development of a Pressure Sensor Matrix Insole utilizing Velostat for Gait Analysis

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This is an introduction of a new technique to analyze the gait cycle of human walking with the support of a pressure sensor material known as Velostat, a pressure-sensitive conductive material. The assessment of the movement of human beings is one of the main cornerstone requirements for diagnosing diseases and setting the stage for a journey towards healing and well-being. There are some traditional methods that are expensive and limited due to widespread accessibility. To overcome this problem, constructing a sensor matrix by using a pressure-sensitive conductive material Velostat is suggested. The matrix consists of an arrangement of Velostat-based pressure sensors which are spread evenly over a confined area over a sheet. The change in the pressure exerted during the gait cycle is detected by each sensor accessing various foot sizes and walking patterns. Signal processing techniques are used in interpreting the collected data accurately, which includes calibration techniques to match up pressure readings with gait parameters such as footfalls, foot pressure distribution and symmetry of gait. Preliminary findings demonstrate the sensor matrix's ability to detect pressure deviations with an accuracy of ±10% and a sensitivity of 0.1 in the range of 0 to 3 N, confirming its efficacy while maintaining affordability and versatility. Potential applications spread from clinical rehabilitation to biomechanics research. Future developments include optimizing the sensor matrix design, integrating it with portable technology for real-time monitoring, and validating its accuracy through widespread clinical trials.

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