ABSTRACT

Wearable inertial sensors are cheap and portable devices that have recently changed the measurement of the postural sway and balance; Several studies have investigated the inter-sensor and test-retest reliability or the validity of the balance in healthy individuals or those at risk. Current studies have shown inertial sensors to be reliable in static standing eyes open and able to distinguish the old from the young or fallers from non-fallers in terms of their amplitude of Medio-lateral sway, gait velocity turn speed, of Measuring during walking, stepping, or sit-to-stand have been used either in natural or other environments remains questionable. The accuracy of the discrimination between the age or fall risk remains undetermined, especially focusing on the ability of the sensors to be able to differentiate between the postural sway components in natural settings compared to the clinical state with the goal towards prevention of falls or near falls. In this type of data collection with sensors, the practical application by previous researchers has shown some of the limitations in the measurement of postural sway during movement, the reliability, and validity, thus making this unclear. Most of the studies also identified how postural stability is usually maintained in regards to the situation where the center of mass ('COM') is located over the base of support ('BOS') while dynamic (moving) or alternatively while static (in a stable position). The methodology entails collecting accelerometer data using the Inertial Measurement Unit appropriately placed on the pelvis. Necessary computation of the accelerometer output and displacement done. Required assumptions were highlighted, and data pre-processing was then described regarding the main results and limitations. The amplitude differences (cm) were recorded for each of the subjects in the first and second trials. Both positive and negative were observed in the trials. The positive corresponds to the increasing amplitude that occurs during increasing walking speed. Likewise, the negative values show decreased amplitude related to decreasing walking speed. That average sway was noted to provide a similar trend in both increasing and decreasing forms. The difference in regards to the sign was noted to be constant. However, an exception was recorded in the last subject. There was an explanation in null of the difference in the amplitude. The apparent limitation concerning the study was in terms of having non-idealist for the

accelerometers, changes in the hypothesis supporting the horizontality of the y-axis during walking, and the presence of the soft-tissue artifact introduced by sliding movement to cause time-varying orientation leading to errors during the double integration are all important limitations noted to influence the outcome of the study.