# Highlights

* There is a debate whether step initiation and the APAs are impaired in early stages of PD, before the start of medication.
* Prior to step initiation, anticipatory postural adjustments act to accelerate the center of body mass forward and laterally over the stance foot by moving the COP posteriorly and toward the stepping leg.
* APAs are usually described using force plate and EMG activation patterns. The backward Cop displacement results from a deactivation of some muscles and activation of others. The lateral COP displacement is a consequence of preloading of the stepping foot by hip abductors.
* The cost and the complexity of measuring APAs using traditional motion analysis, force plate, and EMG System limit their application to clinical practice. For this reason, recently, small, inexpensive, wearable inertial sensors such as accelerometers have been used to quantify gait and postural sway.
* Movement speed increases with age, so there are studies that investigated the influence of the acceleration of the moving segment in the generation and modulation of the APAs. In addition, there are studies when the participants are exposed to different conditions like maximum acceleration or with control acceleration, i.e., they choose the confortable speed. Also, it’s possible to manipulate other conditions like the vision or the cue type.
* The features that we could use obtained from force plate and accelerometers are:
* APA duration.
* APA ML amplitude: ML-COP y ML-Acc.
* APA AP amplitude: AP-COP y AP-Acc.
* Correlation between force plate and acceleration features of APAs.

The onset of APAs (first change in COP from baseline) can be detected by an automated threshold-based algorithm. The APAs are considered completed when both the AP and ML COP go back to baseline values.

* The accelerations of the trunk prior to step initiation characterize APAs, similar to a mirror image of COP displacements, as have been measured traditionally**. So, this is an interesting idea because we want to determine if accelerometers are able to replace the force place. Thus, studying more about this can help us to find a conclusion.**
* There are previous studies that show APAs are programmed according to voluntary movements. Also, they can’t be triggered when the movement is too slow and increase in amplitude when the movement becomes faster.
* It’s possible that we will be able to identify two phases in the COP shift and evaluate the duration: the thrust phase (it corresponds to a COP shift toward the moving leg that is essential to maintain balance) and unloading phase (it’s defined by a COP shift toward the supporting leg).
* An option would consist of dividing the activity in two different phases: the reaction phase (it is calculated as the time from cue to step initiation) and the APA phase (it’s calculated as the time from step initiation to foot-off). **This is a good option to be used when the movement is initiated with some visual or auditory signal.**
* Other interesting measure is changes in the angular position of different limbs of the body (leg, knee, ankle, hip, spine,…).