Introduction

Gait variability, described as stride-to-stride fluctuations of gait parameters and typically quantified through standard deviation (SD), or coefficient of variation (CV), allows identification of changes in the postural control system due to aging, intervention, or pathology [Lord, 2011]. In particular, stride time variability has been proposed as a fall risk predictor [Hausdorff, 2001]. The lack of standardized testing protocols and of knowledge of the reliability of gait variability measurements, however, still limits the interpretability of this data [Lord, 2011]. The 6-minute walk test (6MWT) is a common tool to assess walking functional capacity and the trend is to instrument it using an inertial measurement unit (IMU) [Iosa, 2012]. The test, thus instrumented, becomes a good candidate for providing further functional information, and in particular that regarding gait variability, and may become a standard to this purpose. This study expounds on the feasibility of exploiting this opportunity.

Methods

Sixteen healthy elderly women (84±5 year old) participated in the study after signing an informed consent. They walked back and forth for 6 minutes along a 30 m straight pathway wearing an IMU (FreeSense, Sensorize s.r.l., Rome; fs=100 Hz) fixed to the lower trunk, using an elastic belt. Recorded acceleration signals were low-pass filtered at 20 Hz and segmented into six one-minute time windows. Within each window, the first interval of 15 consecutive strides walked in a straight line, were considered for further analysis. To assess gait variability within each interval, the following parameters were determined: $CV_T$ and $SD_T$ of the durations ($T$) of the strides, and mean values of the unbiased autocorrelation coefficients of the acceleration components, calculated over any two neighbouring strides (vertical: $\bar{a}_v$; medio-lateral: $\bar{a}_m$; antero-posterior: $\bar{a}_a$) [Moe Nilssen, 2004]. $T$ and stride count were determined using the peaks of the anterior-posterior acceleration [Zijlstra, 2003]. An ANOVA analysis (p=0.05) was performed to assess the repeatability of the above-mentioned gait variability parameters, of their mean values and of their SD over the six intervals.

Results

No significant differences were found in gait variability as assessed by any of the selected parameters and over any one minute of the duration of the 6MWT, as exemplified by some of the results depicted in Figure 1.

Discussion

Gait variability parameters in elderly women can be considered to be stable during a 6-min observation period. Even though the above described enhanced 6MWT integrated with a single IMU can provide useful additional information about functional capacity, it doesn’t seem a good candidate for prolonged time gait variability assessment.

References