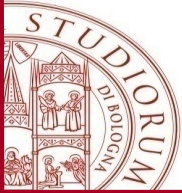
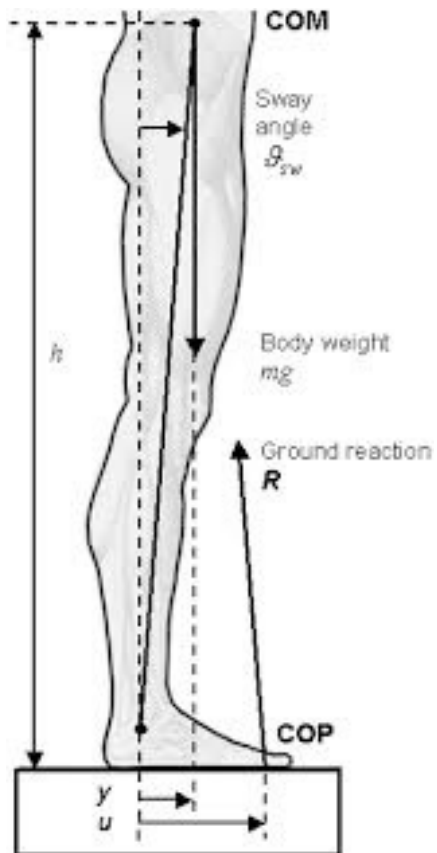


Case Reports



Posture

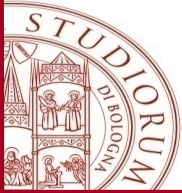
- Conflicting interpretation of COP data using std metrics
- Linear measures only catch the amount of motion, not the control



**Lower complexity
Direction specific
adjustments. (Basic level of
control)**



**Higher complexity
Emergence of anticipatory
postural activity**



Posture

SITTING POSTURE IN INFANTS

- Variability measures of postural sway sensitive to motor and sensory disabilities
- Temporal structure of the variability discriminates typical from atypical dev.

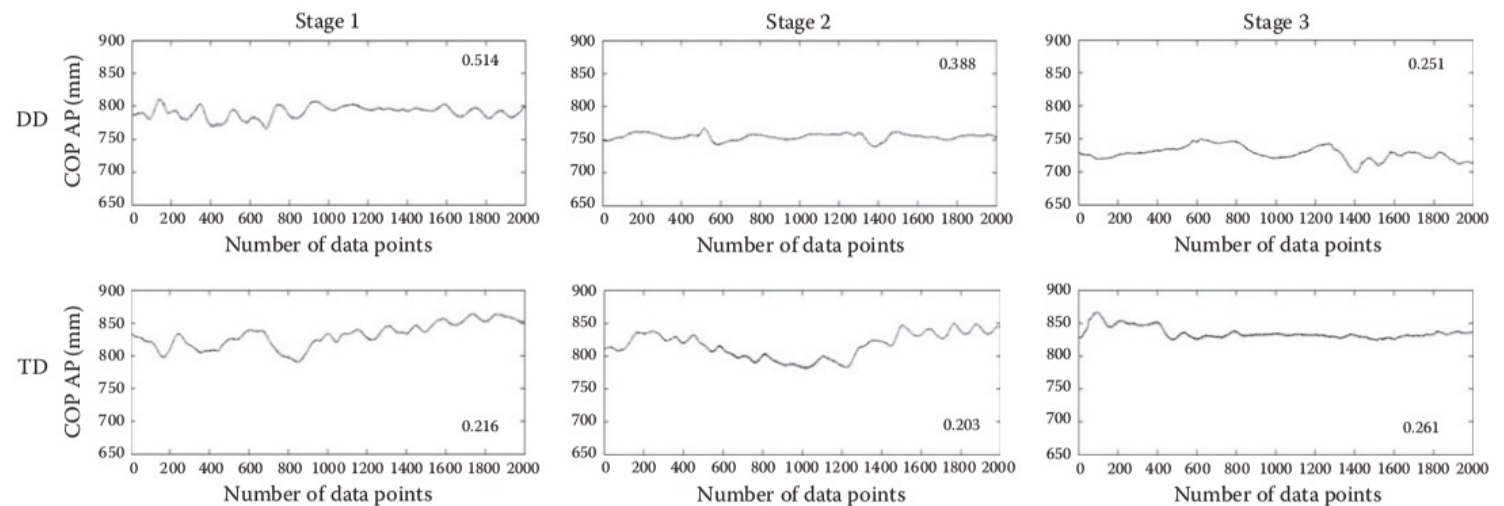
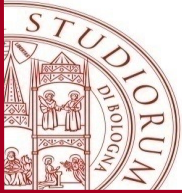


FIGURE 9.1 Postural sway time series for a typically developing (TD) infant and an infant with developmental delays (DD) across the three stages of sitting. Values on the graphs represent the approximate entropy (ApEn) values for each time series in bits.

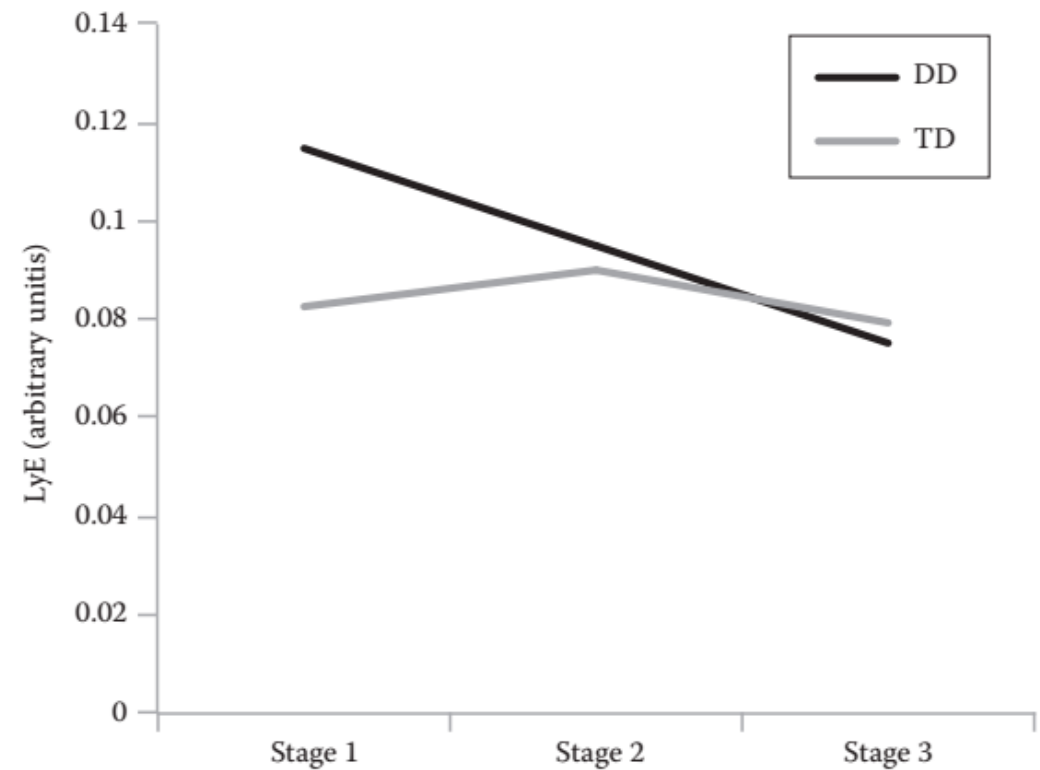


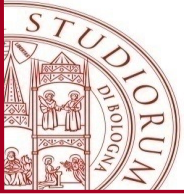
Posture

TABLE 9.1

Root-Mean-Square Values for a Typically Developing (TD) Infant and an Infant with Developmental Delays (DD) across the Three Stages of Sitting

	RMS in AP (mm)	
	TD	DD
Stage 1	8.87	18.56
Stage 2	4.94	19.33
Stage 3	10.41	8.77





Posture

Multiple sclerosis

- Most prevalent progressive neurological disease among young people
- Non linear analysis allows to differentiate from normal and to highlight effect of resistance training
- Increased LyE (Emb Dim 6) and complexity (AEn: lag 6, m 2, r 0.2), mode degrees of freedom in control of posture



Posture

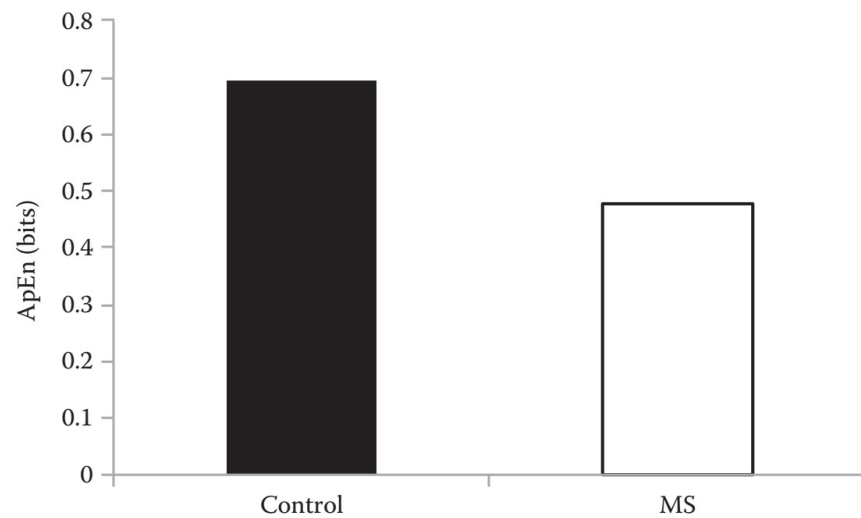


FIGURE 9.4 Approximate entropy (ApEn) values for a patient with multiple sclerosis (MS) and a control participant.

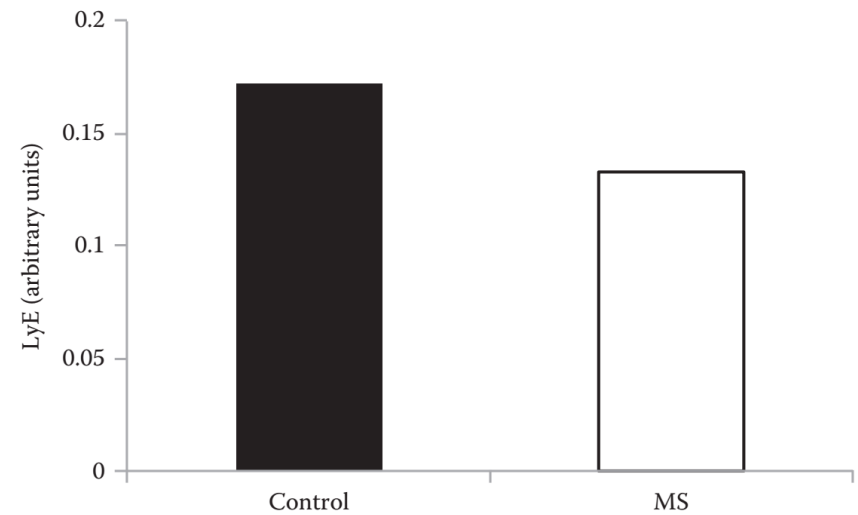


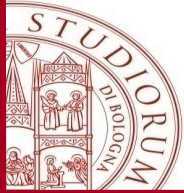
FIGURE 9.3 Lyapunov exponent (LyE) values for a patient with multiple sclerosis (MS) and a control participant.



Posture

Children with autism spectrum disorder

- More rigid and less adaptive motor behavior
- Perceptual and motor rigidity interferes with their attention to and perception of complex variability
- Drastic effect on posture under conditions of modified sensory input
- Less able to adapt to alterations of somato-sensory input and delayed postural control throughout life



Posture



FIGURE 9.5 Experimental setup.

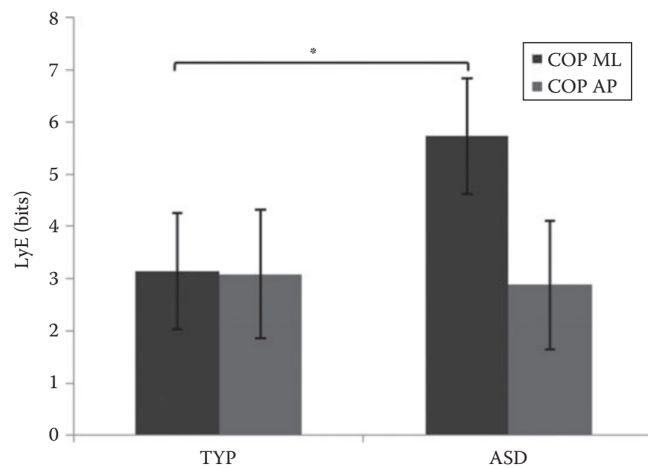


FIGURE 9.7 Lyapunov exponent (LyE) values for the center of pressure data in the medial-lateral (ML) and anterior-posterior (AP) direction in typically developing (TYP) children and children diagnosed with autism spectrum disorders (ASD).

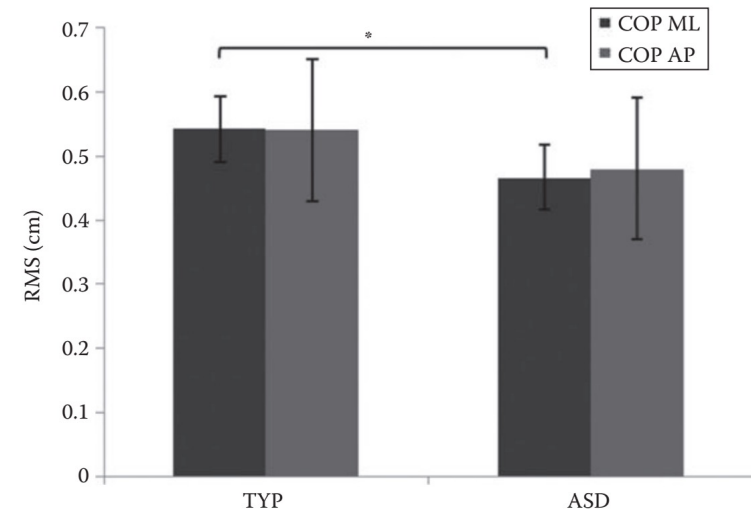


FIGURE 9.6 Root-mean-square (RMS) values for the center of pressure data in the medial-lateral (ML) and anterior-posterior (AP) direction in typically developing (TYP) children and children diagnosed with autism spectrum disorders (ASD).



Posture

Aging

- Posture from integration of visual, somato-sensory and vestibular systems
- Detrended Flustuation analysis, ML showing higher values

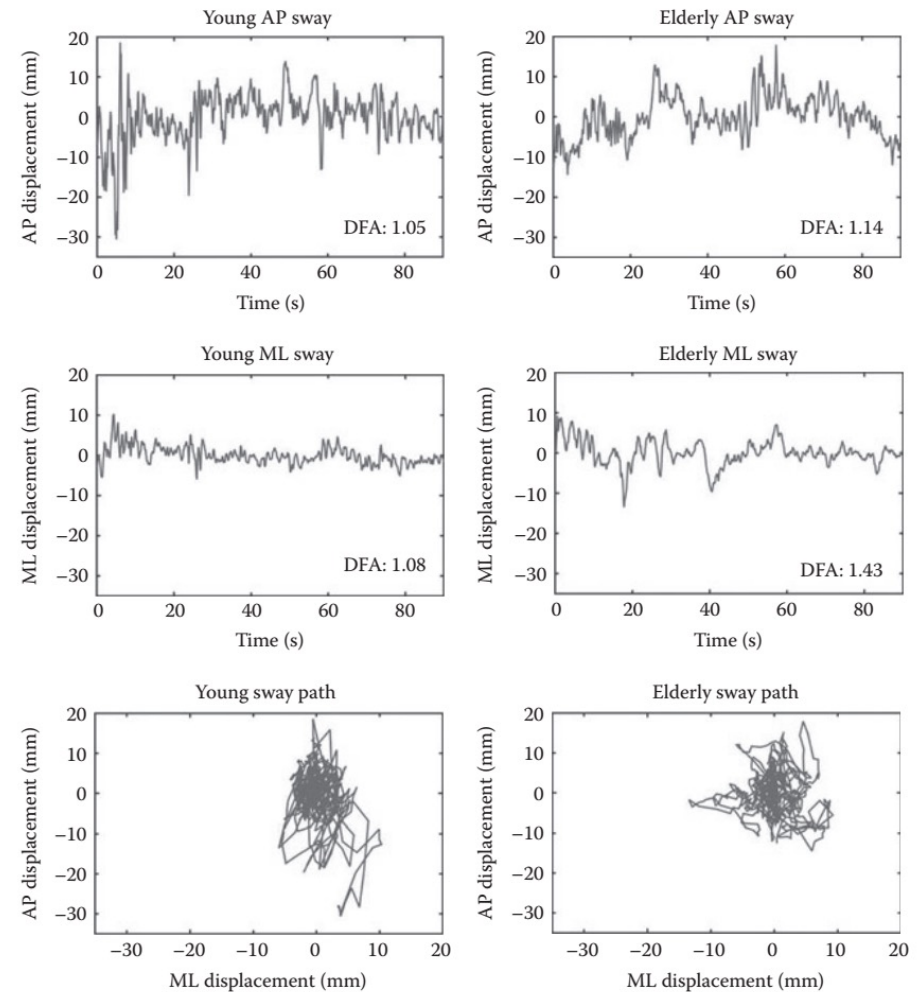
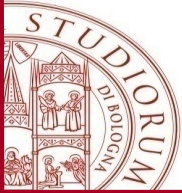


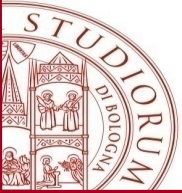
FIGURE 9.8 Anterior-posterior (AP, top row) and medial-lateral (ML, second row) postural sway time series and postural sway paths (bottom row) for a young and an elderly participant.



Gait

Peripheral Arterial Disease

- Atherosclerosis leading to blockage in lower extremities arteries
- LLyE and Pseudoperiodic surrogation
- PAD have larger LlyE than Healthy subjects



Gait

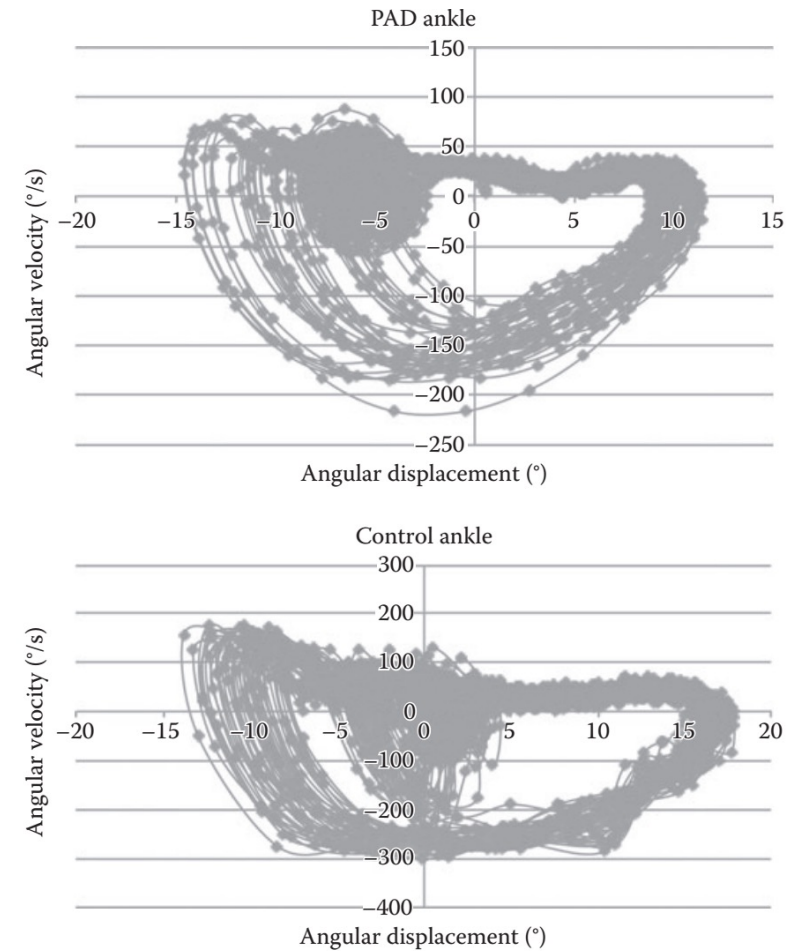
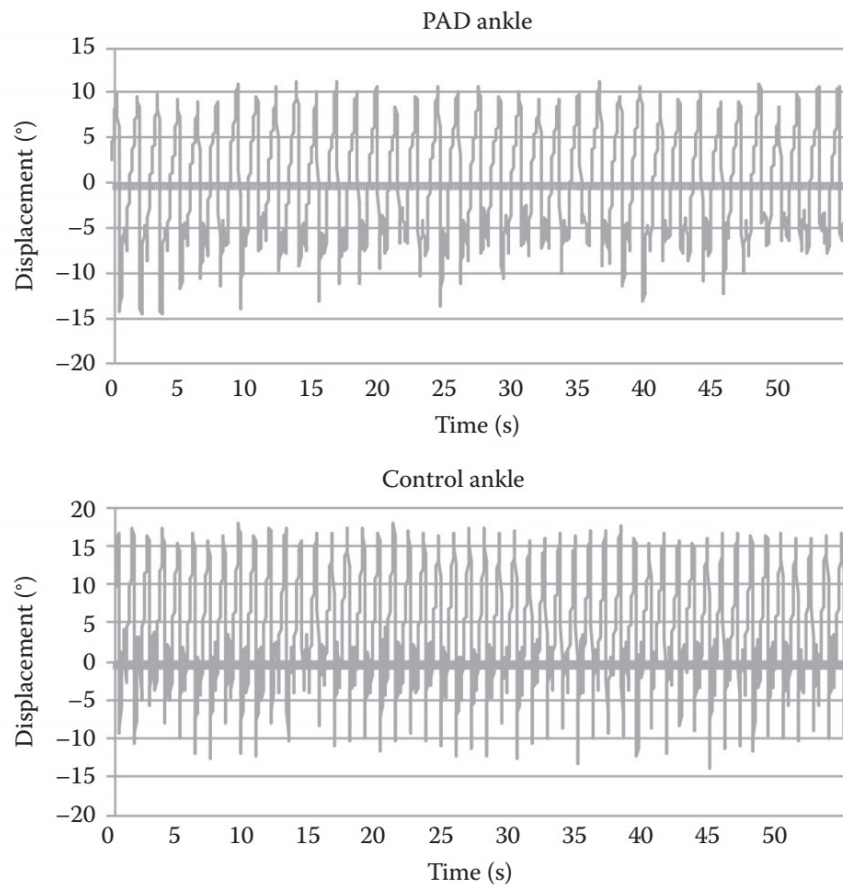


FIGURE 9.10 Phase portraits of a patient with peripheral arterial disease (PAD) and a control participant.



Gait

Chronic Obstructive Pulmonary Disease

- Narrowing airways, destructing lung tissue, dynamic hyperinflammations, also affects skeletal muscle tissue
- SamEn: $m = 2$, $r = 0.25$, $N = 238$

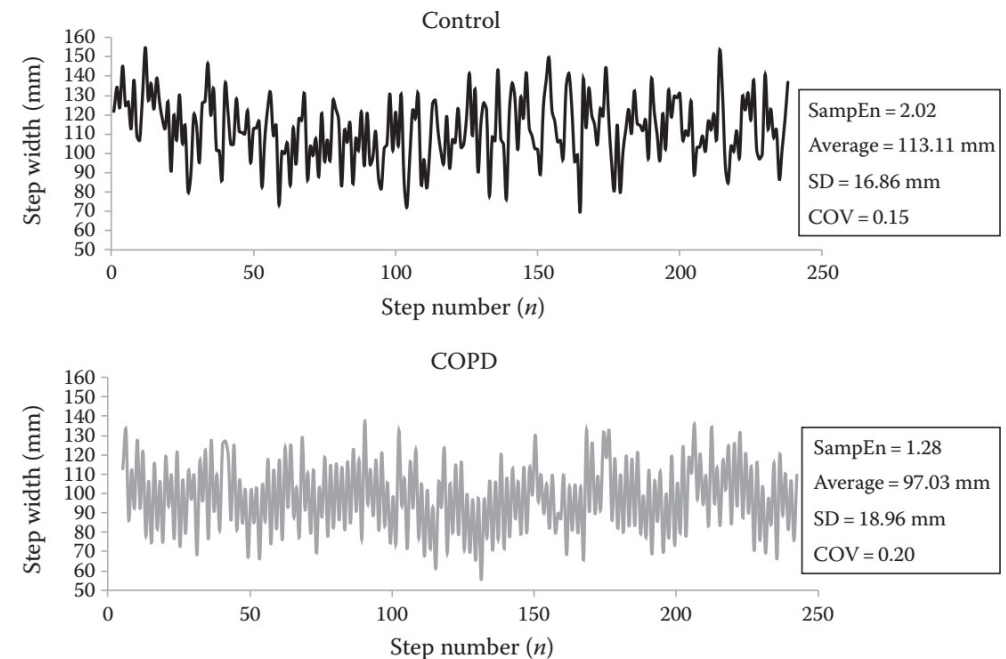


FIGURE 9.11 Step width time series of a patient with chronic obstructive pulmonary disease (COPD) and a control participant. On the right side of each time series, we can see the sample entropy (SampEn), average, standard deviation (SD), and coefficient of variation (COV) values of each step width time series.



Gait

Amputation

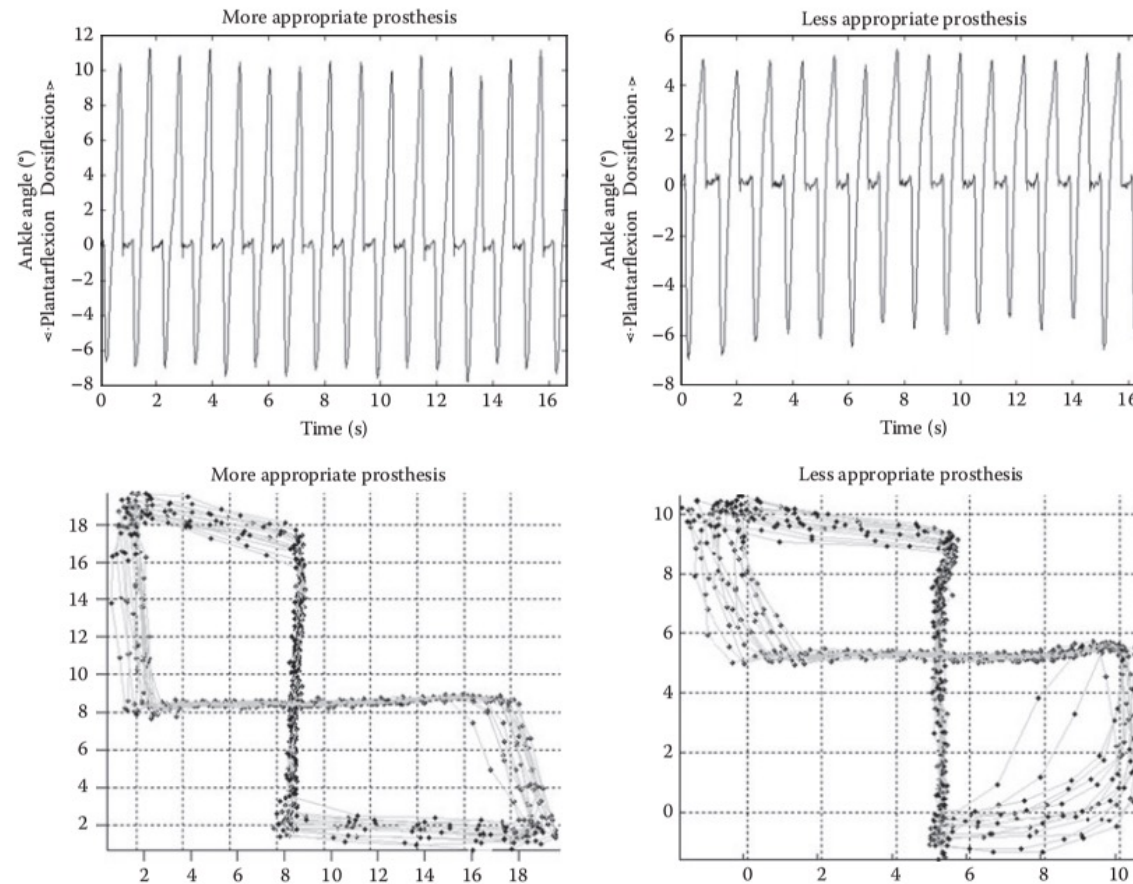
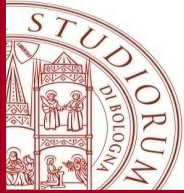


FIGURE 9.12 Ankle joint angle time series of a participant with lower limb amputation with the appropriate (top row, left) and less appropriate (top row, right) prosthesis. On the bottom row, you can observe the respective ankle time series embedded into two dimensions.



Gait

Stroke

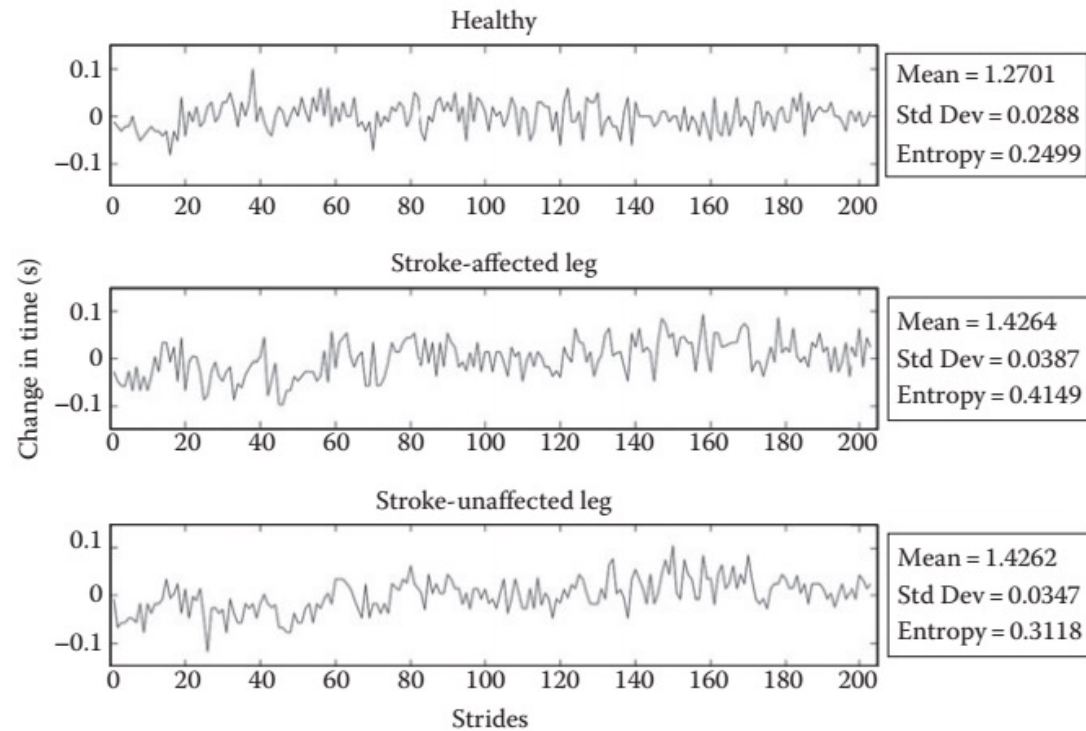


FIGURE 9.13 Stride-time series of a healthy participant, the affected leg of a stroke patient and the unaffected leg of a stroke patient. On the right side of each time series, we can see the mean, standard deviation (Std Dev), and the sample entropy (Entropy) values of each time series.