Supplementary material

1. **Estimation of dynamic component of trunk acceleration,** a_D (in gravity units, **1**g=9.8m/s^2)**:**

$a_D = \left| \sqrt{a_x^2 + a_y^2 + a_z^2} - 1 \right|$, where a_x, a_y, a_z are acceleration components at the 3-dimensional axes of sensor frame.

2. **Definition of multivariate PA pattern.** Information related to ***type***, ***duration*** and ***intensity*** is combined to define 25 multivariate PA states, as follows:

If *Type=Non-Locomotion,* divide each detected period in epochs of 1second length. For each epoch calculate movement *intensity* as the mean value of dynamic component of trunk acceleration, *mean*(a_D), then assign to each epoch a PA state according to the value of *mean*(a_D), as indicated in Table 1S.

If *Type= Locomotion,* assign to each second of the respective period a PA state, according to locomotion *duration* (s) and i*ntensity* expressed in terms of *cadence* (steps/min), as indicated in Table 1S

Table 1S: Mapping of PA dimensions into multivariate PA states; each PA state has assigned a numerical code and a color for pattern visualization.

Type	Duration	Intensity	Multivariate PA states
If Type=Non-locomotion		& *mean*(a_D)≤*0.1* (verylow)	1
		& 0.1<*mean*(a_D)≤0.2 (low)	2
		& 0.2<*mean*(a_D)≤0.4 (medium)	3
		& 0.4<*mean*(a_D)≤0.6 (high)	4
		& *mean*(a_D)>0.6 (very high)	5
If Type=Locomotion	& *duration* ≤ *30* (very short)	& *cadence*≤*70* (very slow)	6
		& 70<*cadence*≤90 (slow)	7
		& 90<*cadence*≤110 (moderate)	8
		& 110<*cadence*≤130 (fast)	9
		& *cadence*>130 (very fast)	10
	& 30<*duration* ≤ *120* (short)	& *cadence*≤*70* (very slow)	11
		& 70<*cadence*≤90 (slow)	12
		& 90<*cadence*≤110 (moderate)	13
		& 110*cadence*≤130 (fast)	14
		& *cadence*>130 (very fast)	15
	& 120<*duration* ≤ *360* (medium)	& *cadence*≤*70* (very slow)	16
		& 70<*cadence*≤90 (slow)	17
		& 90<*cadence*≤110 (moderate)	18
		& 110<*cadence*≤130 (fast)	19
		& *cadence*>130 (very fast)	20
	& *duration* > *360* (long)	& *cadence*≤*70*(very slow)	21
		& 70<*cadence*≤90 (slow)	22
		& 90<*cadence*≤110 (moderate)	23
		& 110*cadence*≤130 (fast)	24
		& *cadence*>130 (very fast)	25

3. Complexity analysis (Lempel-Ziv and Permutation Lempel-Ziv computation)

a) Theoretical background for computation of LZC can be found in (1); additional information and Matlab routine for calculation of LZC metric can be found in (2) and downloaded online (accessed 17th Oct 2017)
(http://www.gao.ece.ufl.edu/GCTH_Wileybook/programs/LZ_complexity/LZ_complexity.m)

b) Theoretical background and Matlab routine for computation of PLZC metric can be found in (3).

c) Principle of LZC and PLZC computation:

LZC is a non-parametric measure of complexity applied directly to analyze the PA pattern represented as a symbolic sequence (i.e., succession of PA states coded with discrete values from 1 to 25).

PLZC(m,t) is a parametric measure of complexity implying two steps:

1. Generate a permutation/ordinal pattern from the original symbolic sequence (PA pattern) by comparison of m consecutive PA states, separated in time by a lag $t > 1$. Detailed description of ordinal patterns generation for different parameters m and t is provided in (4).
2. Apply LZC to the ordinal pattern obtained according to selected parameters *(m, t)*.
   Since the parameters of PLZC computation can affect its output, we investigated the results for different values of m and t. The analysis showed relatively stable complexity values for wide range of values chosen for m and t (m=4 to 7, t=10 to 30), Table 2S. The optimal combination in terms of discriminative properties and computational efficiency appeared m=4 and t=10.

4. Supplementary results

Table 2S: Comparative values of LZC and PLZC(m,t) obtained with various computational parameters.

Complexity metrics	Fully confident	Less confident	p-value	Effect size (Cliff's delta)
LZC	0.27±0.04	0.23±0.04	0.003	0.56
PLZC(4,10)	0.4±0.07	0.3±0.06	0.001	0.62
PLZC(4,15)	0.43±0.09	0.33±0.05	0.004	0.54
PLZC(4,20)	0.44±0.09	0.34±0.05	0.006	0.52
PLZC(4,30)	0.45±0.09	0.35±0.06	0.005	0.53
PLZC(7,10)	0.3±0.05	0.24±0.04	0.001	0.61
PLZC(7,15)	0.32±0.06	0.26±0.04	0.005	0.53
PLZC(7,20)	0.33±0.07	0.26±0.04	0.007	0.51
PLZC(7,30)	0.34±0.07	0.27±0.04	0.006	0.52

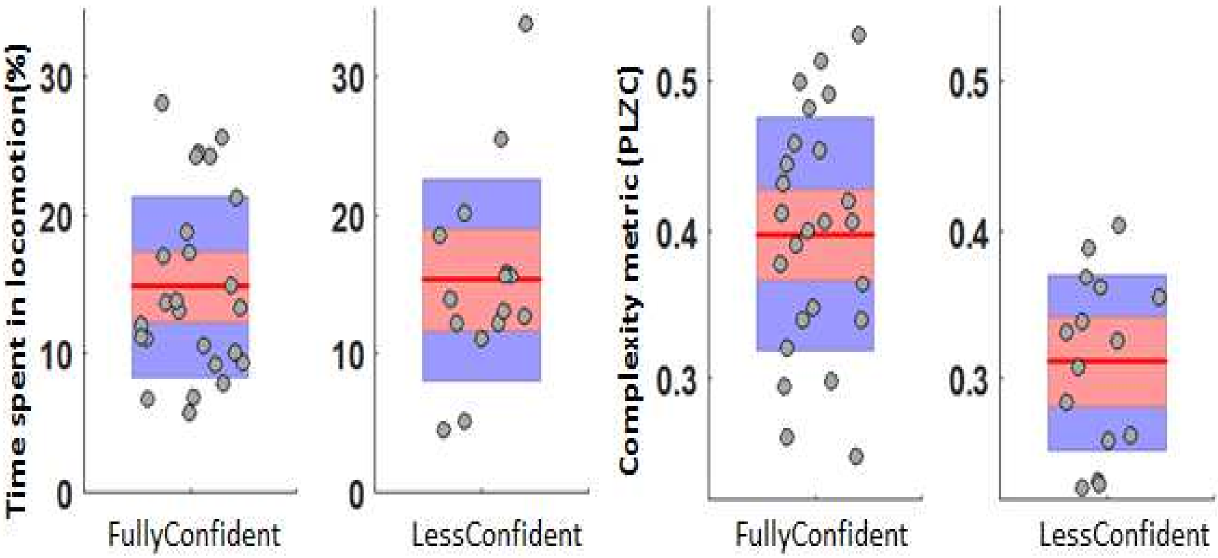

Fig. 1S: Illustration of discriminative properties of *time spent in locomotion* (%) and *complexity* of PA patterns (quantified with *PLZC*). The graphs shows the group mean (red line), standard deviation (blue shadow), as well as the values corresponding to the subjects in each group.

References

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2 Gao J, Cao Y, Tung W-w, Hu J. Multiscale analysis of complex time series: integration of chaos and random fractal theory, and beyond: John Wiley & Sons; 2007.

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4 Parlitz U, Berg S, Luther S, Schirdewan A, Kurths J, Wessel N. Classifying cardiac biosignals using ordinal pattern statistics and symbolic dynamics. Computers in biology and medicine. 2012;42(3):319-27.