Supplementary Materials and Methods 1. Because EMG-recordings provide high frequency, noisy signals [for of all kind of reasons such as electrode position, electrode-muscle/skin interface properties, electronics (De Luca et al. 2010)], intensive signal post-processing (such as filtering, rectification, etc.) is required. These methods of analysis are variably applied or combined which constraints comparisons and might even impact the conclusions of these analyses (e.g. De Luca et al. 2010; St. George et al. 2019; Zschorlich 1989). We provide below a graphical comparison of four methods of EMG analyses: 1) the filtering method developed by Hylander and Johnson (1993) and largely used in primate EMG studies (e.g. Boyer et al. 2007; Larson and Stern 2007; Larson and Stern 2009; Patel et al. 2012); 2) the method provided in the integrative EMG/kinematics study of Courtine et al. (2005), which is much less filtered; 3) a filtering method commonly used in human locomotion literature at 20Hz; 4) the same method filtered at 10Hz (i.e. the method used in the present study).

We used MATLAB (R2019a) to analyse the EMG signals and to apply the different types of analyses on the raw EMG signals (the script is provided below):

1. Band-pass filtered (30Hz to 1kHz), rectified (full-wave; see Courtine et al. 2005);
2. Root Mean Square (RMS) at intervals of 2ms, using a time constant of 42ms (see Hylander and Johnson 1993);
3. Band-pass 4th order Butterworth filter zero phase shift (5Hz to 500Hz), centred, rectified (full-wave), low-pass 4th order Butterworth filter zero phase shift (20Hz), rectified (full-wave);
4. Band-pass 4th order Butterworth filter zero phase shift (5Hz to 500Hz), centred, rectified (full-wave), low-pass 4th order Butterworth filter zero phase shift (10Hz), rectified (full-wave).

Overall, all the methods can be considered equivalent and should conduct to similar interpretation of the activity pattern of muscles (Fig. S1). Note that the method of Hylander and Johnson (1993) appears to slightly shift the activation toward an earlier activation profile. Comparing muscle phasic activities coming from different EMG analyses is therefore possible. Yet, comparing key events and the duration of the general activity between studies appear irrelevant as we observed a shift of the instant peak with the method of Hylander and Johnson (1993) and a reduction of the activity period could result from the method of Courtine et al. (2005) because it does not provide an envelope of the signal.

Matlab scripts

In each script (Matlab R2019a), `muscle` is the raw signal of the muscle considered and `Max` is the maximum contraction value (peak) of the muscle considered for the set of quadrupedal walking sequences.

1. Band-pass filtered (30Hz to 1kHz), rectified (full-wave; see Courtine et al. 2005)

```
fr=2000;          %recording frequency (Hz)
filtered=bandpass(muscle,[30 1000],fr);
filtered1=(abs(filtered))/Max;
```

2. Root Mean Square (RMS) at intervals of 2ms, using a time constant of 42ms (see Hylander and Johnson 1993);

```
filelength=length(muscle);

for n = 1:4:(filelength-84)
    R(n) = sqrt((sum(muscle(n:83+n).^2))/84);
end

Data=(R(R~=0)')/Max;
```

3. Band-pass 8th order Butterworth filter (5Hz to 500Hz), centred, rectified (full-wave), low-pass 8th order Butterworth filter (20Hz), rectified (full-wave).

```
fr=2000;          %recording frequency (Hz)
[a,b] = butter(2,[5,500]/(fr/2),'bandpass');
filtered=filtfilt(a,b,muscle);
filtered1=filtered-mean(filtered);
filtered2=abs(filtered1);

[c,d] = butter(2,20/(fr/2),'low');
filtered3=filtfilt(c,d,filtered2);
filtered4=abs(filtered3)/Max;
```

4. Band-pass 8th order Butterworth filter (5Hz to 500Hz), centred, rectified (full-wave), low-pass 8th order Butterworth filter (10Hz), rectified (full-wave).

The script is the same than in 3 But the following line differs:

```
[c,d] = butter(2,10/(fr/2),'low');
```

Journal of Experimental Biology • Supplementary information

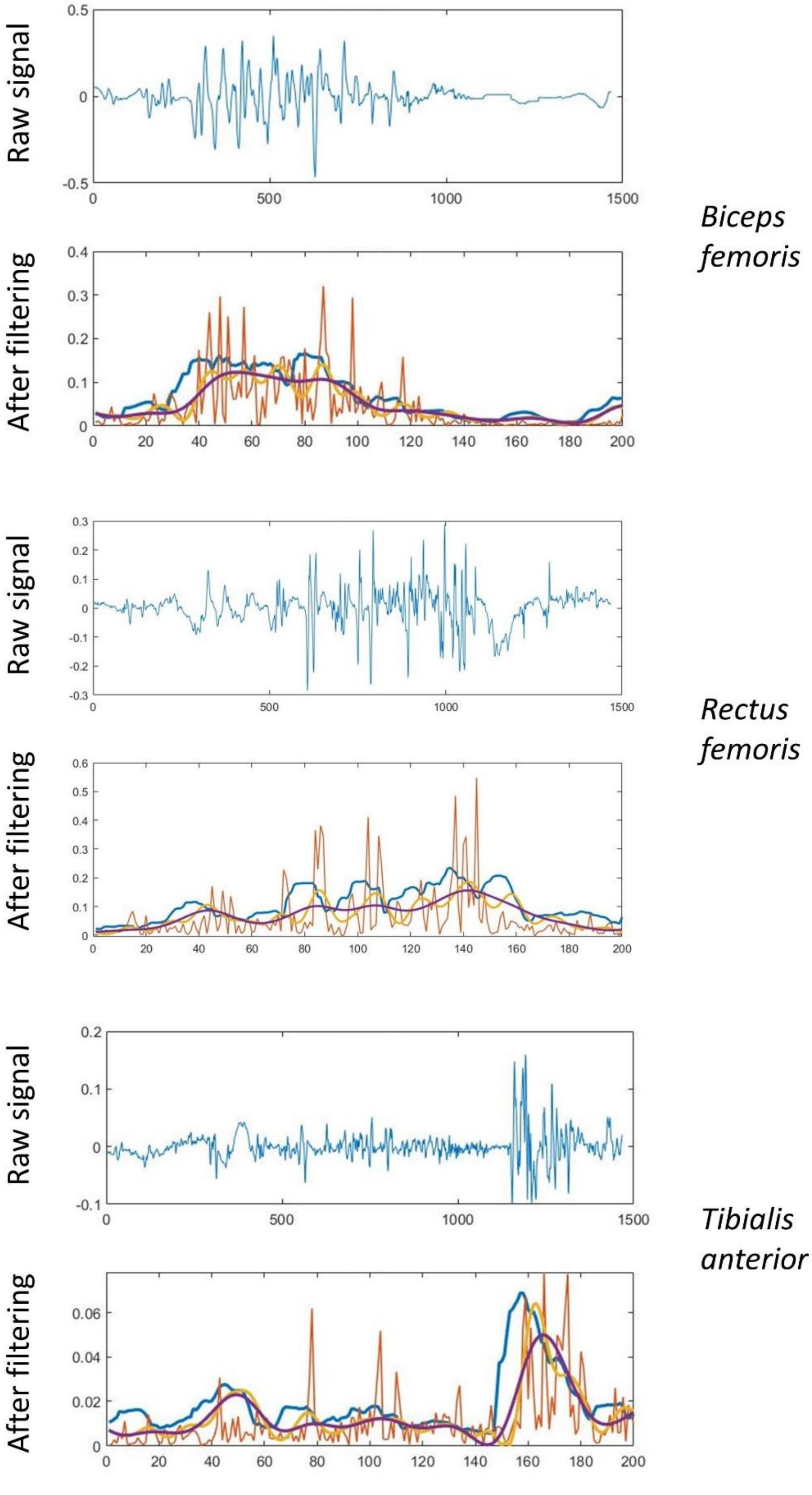

Fig. S1. Examples of the raw EMG signals in blue (*Biceps femoris, Rectus femoris and Tibialis anterior*) and the impact of the different filtering methods on the signal. On the graphics after filtering, the Hylander and Johnson (1993) method is indicated in blue, the Courtine et al. (2005) method is in red, the filtering method commonly used in human locomotion literature at 20Hz is in yellow and the same method filtered at 10Hz (i.e. the method used in the present study) is indicated in purple.

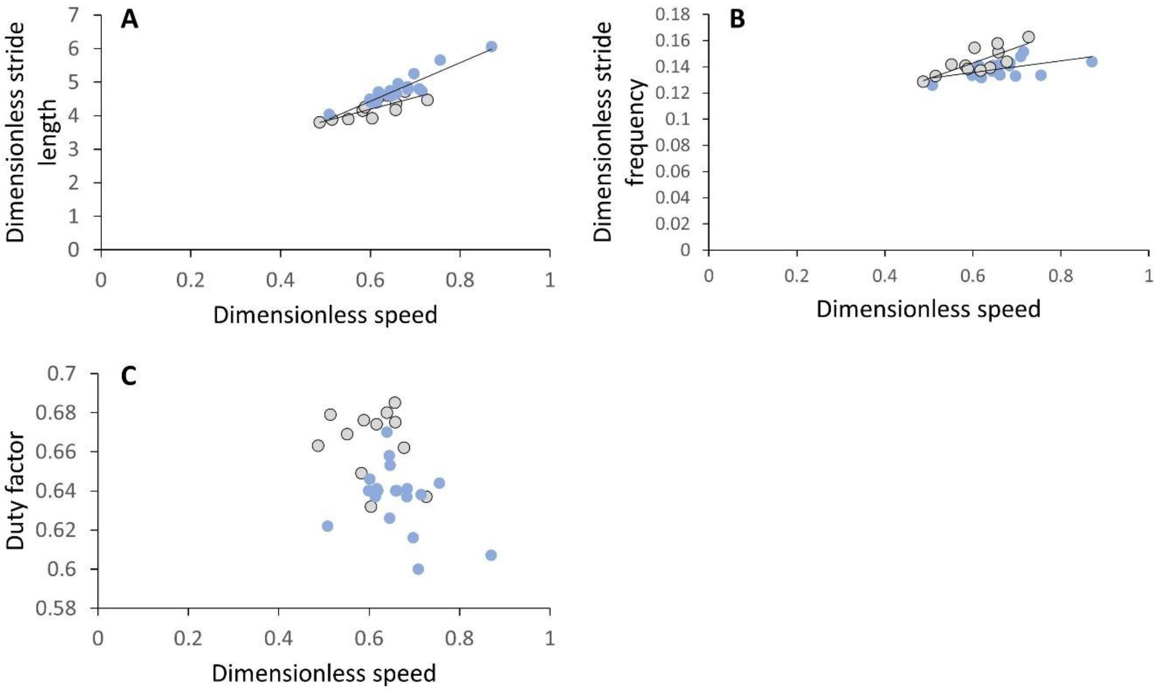

Fig. S2. Relationships between dimensionless stride length and dimensionless speed (A; Id1 r=0.79, P=0.0023; Id2 r=0.93, P<0.0001), dimensionless stride frequency and dimensionless speed (B; Id1 r=0.79, P=0.0023; Id2 r=0.54, P=0.0159) and duty factor and dimensionless speed (C) for both individuals separately. The grey circles represent the quadrupedal strides for Id1 (n=12) and the blue circles represent the strides for Id2 (n=19). A similar colour code is used in the figure 6.

Journal of Experimental Biology • Supplementary information

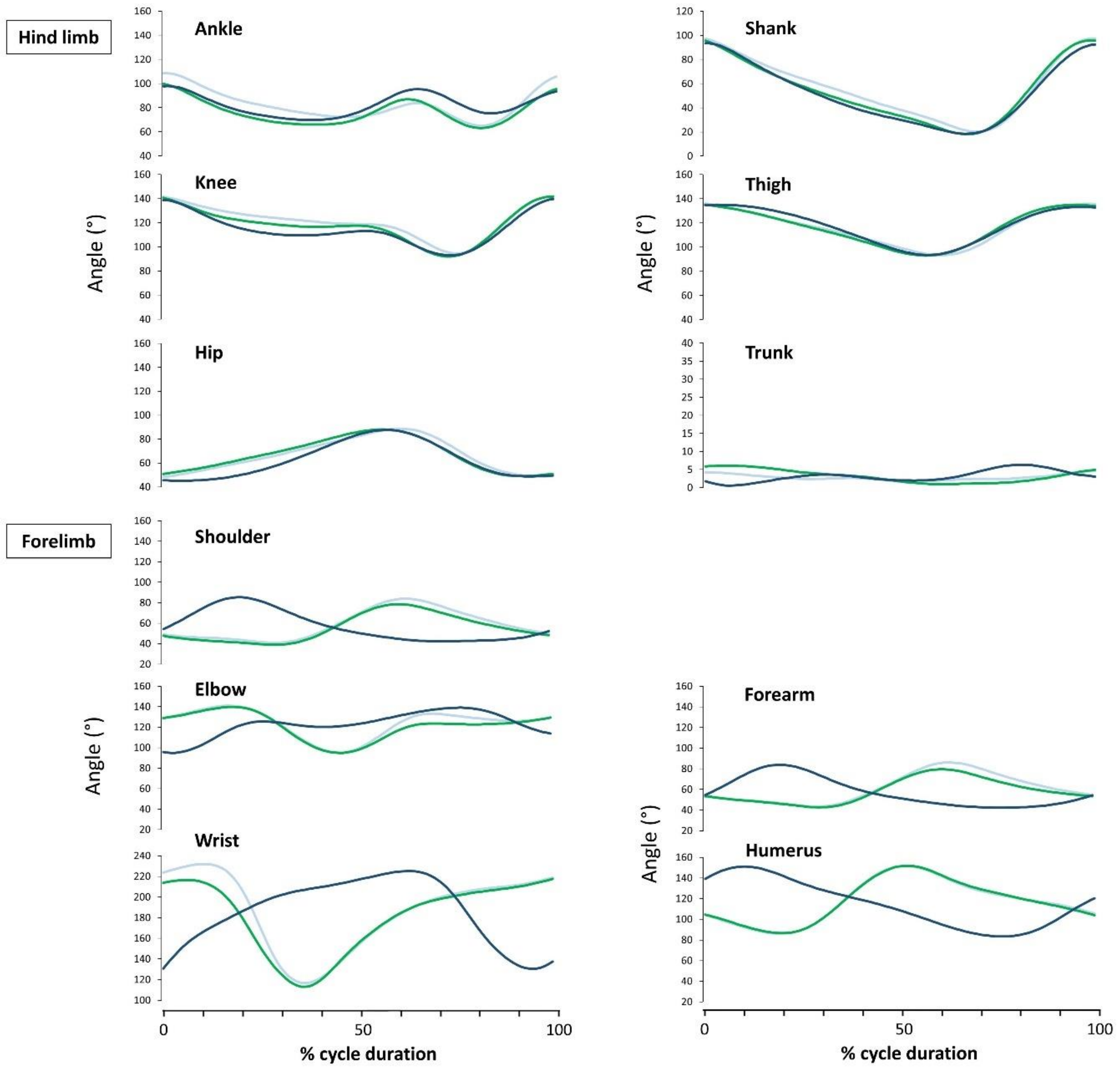

Fig. S3. Average hind limb and forelimb joint and segment angles, during DSDC walking on the ground (green), LSLC walking on the ground (dark blue), DSDC walking on the branch (light blue). Note that in the lateral sequences the pattern is shifted horizontally for the forelimbs, as the right forelimb is swinging just after the ipsilateral (right) hind limb, while it is swinging after the contralateral (left) hind limb in the diagonal sequences.

Journal of Experimental Biology • Supplementary information