**Appendix A. Supplementary material**

The mathematical procedures used to identify the events were implemented in the Visual 3D software (C-Motion Inc., Germantown, MD, USA), according to the publications of the authors who proposed the algorithms.

*Identification of events with the algorithm proposed by Hreljac and Marshall*(1): This algorithm uses the information of vertical and anterior-posterior acceleration of the foot markers. Foot strike (*tFS*) was set as the peak vertical acceleration of the heel marker, which is determined as the time at which the derivative of acceleration (jerk) equals zero, according Eq. (A.1) and Eq. (A.2):

$j\left(z\_{heel}\right)=\frac{∂^{3}z\_{heel}}{∂t^{3}}$ Eq. (A.1)

$t\_{FS}=j(z\_{heel})\_{zero}$ Eq. (A.2)

where *j(zheel)* is the third time derivative of vertical displacement (z axes) of marker placed on posterior surface of calcaneus, *zheel* is the vertical position and *t* is time.

Toe-off (*tTO*) was set as the peak anterior-posterior acceleration of the fifth metatarsal head marker and also the time at which the jerk equaled zero, according Eq. (A.3) and Eq. (A.4):

$j\left(x\_{fmh}\right)=\frac{∂^{3}x\_{fmh}}{∂t^{3}}$ Eq. (A.3)

$t\_{TO}=j(x\_{fmh})\_{zero}$ Eq. (A.4)

where *j(xfmh)* is the third time derivative of anterior posterior displacement (x axes) of marker placed on fifth metatarsal head, *xfmh* is the anterior-posterior position and *t* is time.

Jerk was used to automatically establish the point at which the acceleration is maximum.

*Identification of events with the algorithm proposed by Ghoussayni et al.*(2)*:* This algorithm determines events based on a marker’s speed in the sagittal plane, *i.e.*, the combination of speeds of the vertical and anterior-posterior motions. Initially, the displacement of markers on the sagittal plane was determined, according Eq. (A.5):

$d=\sqrt{x^{2}+z^{2}}$ Eq. (A.5)

where *d* is the displacement of markers on the sagittal plane, *x* is the displacement of markers on the x axes e *z* is the displacement on the z axes. Speed is the first derivative of markers position on sagittal plane with respect to time (Eq. (A.6)):

$speed\left(x,z\right)=\frac{∂d}{∂t}$ Eq. (A.6)

where *speed* is the first time derivative of displacement (*d*) of markers on the sagittal plane and *t* is time.

A Foot strike (*tFS*) was determined as the time point at which the heel marker speed (*speedheel*) reached a threshold of 50 cm/s on the sagittal plane (Eq. (A.7)), whereas a Toe-off (*tTO*) was established as the time point at which the fifth metatarsal head marker speed (*speedfmh*) reached 50 cm/s (Eq. (A.8)).

$t\_{FS}=(speed\_{heel})\_{50cm/s}$ Eq. (A.7))

$t\_{TO}=(speed\_{fmh})\_{50cm/s}$ Eq. (A.8))

Similar to Bruening and Ridge(3), we found that the 5-cm/s threshold recommended by Ghoussayni et al.(2) was too low and increased it to 50 cm/s.

*Identification of events with the algorithm proposed by* *Hsue et al*.(4):This algorithm uses the information of anterior-posterior foot marker acceleration (Eq. (A.9)):

$a\left(x\right)=\frac{∂^{2}x}{∂t^{2}}$ Eq. (A.9)

where *a(x)* is the second time derivative of anterior-posterior displacement (x axes) of heel marker, *x* is the anterior-posterior position of heel or fifth metatarsal head marker and *t* is time.

An FS corresponded to the minimum heel marker acceleration (Eq. (A.10)), whereas a TO event was set as the maximum heel marker acceleration (Eq. (A.11)).

$t\_{FS}=a(x)\_{min}$ Eq. (A.10))

$t\_{TO}=a(x)\_{max}$ Eq. (A.11))

For an FS, *Hsue et al.*(4) proposed the use of either the heel or fifth metatarsal head marker. However, in the present study, we used the heel marker because of its greater accuracy.

*Identification of events with the algorithm proposed by Zeni et al.*(5)*:* This algorithm uses the information of anterior-posterior displacement of the foot markers with respect to the pelvis. First, the anterior-posterior displacement of the heel marker was subtracted from the anterior-posterior displacement of the sacrum marker (Eq. (A.12)):

$t\_{FS}=(x\_{heel}-x\_{sacrum})\_{max}$ Eq. (A.12)

where *tFS* represents the maximal displacement of the heel (*xheel*) from the sacrum (*xsacrum*) markers on anterior-posterior axes.

Same procedure was performed with respect to fifth metatarsal head and sacrum markers (Eq. (A.13)):

$t\_{TO}=(x\_{fmh}-x\_{sacrum})\_{min}$ Eq. (A.13)

where *tTO* represents the minimum displacement of the fifth metatarsal head (*xfmh*) from the sacrum (*xsacrum*) markers on anterior-posterior axes.

*Identification of events with the algorithm proposed by* *Desailly et al.*(6): This algorithm uses kinematic information combined with a specific sequence of marker displacement signal filtering in the anterior-posterior direction. First, the signal from the heel marker was used to determine gait frequency. Then, this signal was filtered by a high-pass filter at a cutoff frequency of 0.5-times the gait frequency (*fxheel*). The highest point of this filtered signal in the anterior-posterior direction was equivalent to an *tFS* (Eq. (A14)).

$t\_{FS}=(fx\_{heel})\_{max}$ Eq. (A.14)

 For a TO event, the signal from the fifth metatarsal head marker was filtered by a high-pass filter at a frequency of 0.5-times the gait frequency (*fxfmh*), and the lowest point of this filtered signal in the anterior-posterior direction was equivalent to the *tTO* (Eq. (A15)).

$t\_{TO}=(fx\_{fmh})\_{min}$ Eq. (A.14)

For TO events, Desaillyet al*.*(6) proposed a frequency equivalent to 1.1-times the gait frequency. However, in the present work, similar to Bruening and Ridge(3), we found that reducing this factor to 0.5 increased the accuracy of the algorithm.

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2. Ghoussayni S, Stevens C, Durham S, Ewins D. Assessment and validation of a simple automated method for the detection of gait events and intervals. Gait Posture. 2004;20(3):266–72.

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4. Hsue B-J, Miller F, Su F-C, Henley J, Church C. Gait timing event determination using kinematic data for the toe walking children with cerebral palsy. J Biomech. Elsevier; 2007 Jan;40:S529.

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