Current practices in clinical gait analysis in Europe: A comprehensive survey-based study from the European society for movement analysis in adults and children (ESMAC) standard initiative

Armand, Stéphane; Sawacha, Zimi; Goudriaan, Marije; Horsak, Brian; van der Krogt, Marjolein; Huenaerts, Catherine; Daly, Colm; Kranzl, Andreas; Boehm, Harald; Petrarca, Maurizio; Guiotto, Anna; Merlo, Andrea; Spolaor, Fabiola; Campanini, Isabella [**and 7 more**]

Survey 2 - ESMAC Standard

Objective: To review current practice in Europe concerning Clinical Gait Analysis

1. What is the name of your gait lab?

2. Where is your gait laboratory? (country)

3. Where is your gait laboratory? (city)

4. In what type of institution is your Gait Lab located?

- ◯ University Hospital
- ◯ Public Hospital
- ◯ Private Hospital
- ◯ Clinical
- ◯ University
- ◯ Rehabilitation center
- ◯ Other (please specify)

5. How many patients did you assess using instrumented 3-D gait analysis during the last 5 years?

- ◯ <100
- ◯ 100-200

- ◯ 200-500
- ◯ 500-1000
- ◯ >1000

6. How many patients did you assess using only video analysis during the last 5 years?

- ◯ <100
- ◯ 100-200
- ◯ 200-500
- ◯ 500-1000
- ◯ >1000

7. In your lab which age groups of patients do you assess?

- ◯ Children
- ◯ Adults
- ◯ Both

8. Which patient populations come into your lab for Clinical Gait Analysis (CGA)? Neurological problems:

- ☐ Cerebral palsy
- ☐ Traumatic brain injury
- ☐ Stroke
- ☐ Spina Bifida
- ☐ Idiopathic Toe Walkers
- ☐ Neuromuscular diseases
- ☐ Multiple sclerosis
- ☐ Parkinson
- ☐ None
- ☐ Other

9. Which patient populations come into your lab for Clinical Gait Analysis (CGA)? Non-neurological problems:

- ☐ Arthrosis
- ☐ Spinal deformities
- ☐ Lower limb amputees

- [ ] Orthopedic trauma
- [ ] Club Foot
- [ ] None
- [ ] Other

10. Which patient population do you see the most in your lab for CGA? Neurological problems:

- ◯ Cerebral palsy
- ◯ Traumatic brain injury
- ◯ Stroke
- ◯ Spina Bifida
- ◯ Idiopathic Toe Walkers
- ◯ Neuromuscular diseases
- ◯ Multiple sclerosis
- ◯ Parkinson
- ◯ Other

11. Which patient population do you see the most in your lab for CGA? Non-neurological problems:

- ◯ Arthrosis
- ◯ Spinal deformities
- ◯ Lower limb amputees
- ◯ Orthopedic trauma
- ◯ Club Foot
- ◯ Other

12. How often do you use CGA when:
Scale 0-10 for each item (0-never, 10-always)

	0	1	2	3	4	5	6	7	8	9	10
Deciding on treatment specifics as a baseline measurement	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Determining treatment effect - short term	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Determining treatment effect - long term	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

	0	1	2	3	4	5	6	7	8	9	10
Follow up the natural history of the disease	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

13. How much (in Euros) does a Clinical Gait Analysis in your institution cost?

- ◯ No costs
- ◯ 1-100
- ◯ 100-200
- ◯ 200-500
- ◯ 500-1000
- ◯ 1000-1500
- ◯ 1500-2000
- ◯ >2000

14. Do you use one of the best practice guidelines for CGA?

	No	Partially	Completely
CMAS	◯	◯	◯
SIAMOC	◯	◯	◯
SENIAM	◯	◯	◯
CMLA	◯	◯	◯
Other	◯	◯	◯

Please specify the society

15. How many people in your lab are members of one of these societies? Please write a number.

ESMAC

SIAMOC

CMAS

GAMMA

SOFAMEA

SMALLL

Other (please write the name of the society and number)

16. Does your lab have a licence to conduct CGA?

- ◯ Yes
- ◯ No
- ◯ There is no licence to conduct CGA in my country

17. How many people in each of the following disciplines work in the gait lab team? Please write a number.

Physiotherapist

Orthopaedic surgeon

PRM doctor

Sport scientist

Bioengineer

Clinical technologist

Neurologist

Orthotist

Prosthetist

Podiatrist

Pediatrician

Researcher

If other specify who and numbers

18. Who is the head of the gait lab?

	Physiotherapist	Orthopaedic surgeon	PRM doctor	Sport Scientist	Bioengineer	Clinical technologist	Neur
Medical	◯	◯	◯	◯	◯	◯	◯
Technical	◯	◯	◯	◯	◯	◯	◯

Please specify who

19. In which of the following tasks are the staff working in the CGA involved?

- ☐ Decision to perform the CGA

- [ ] Physical exam
- [ ] Data collection
- [ ] Data processing
- [ ] Data reduction/analysis
- [ ] Data interpretation
- [ ] Clinical decision-making related to the outcomes of the CGA
- [ ] Other

20. How often do staff receive training in the following tasks?

	Never	Only at the opening of the lab	At least once a year	At least once each 2 years	At least once each 5 years	Randomly	Not used in my lab	Other (please specify below)
Physical exam	◯	◯	◯	◯	◯	◯	◯	◯
Marker placement	◯	◯	◯	◯	◯	◯	◯	◯
Surface EMG placement	◯	◯	◯	◯	◯	◯	◯	◯
Fine-wire EMG placement	◯	◯	◯	◯	◯	◯	◯	◯
Data collection	◯	◯	◯	◯	◯	◯	◯	◯
Data reduction/analysis	◯	◯	◯	◯	◯	◯	◯	◯
Data interpretation	◯	◯	◯	◯	◯	◯	◯	◯
Clinical recommendations	◯	◯	◯	◯	◯	◯	◯	◯
Other (please specify below)	◯	◯	◯	◯	◯	◯	◯	◯

Please specify

21. How often do you test within and between consistency of the personnel for the following tasks?

	Never	Only at the opening of the lab	At least once a year	At least once each 2 years	At least once each 5 years	Randomly	Not used in my lab	Other
Physical exam	◯	◯	◯	◯	◯	◯	◯	◯
Marker placement	◯	◯	◯	◯	◯	◯	◯	◯
Surface EMG placement	◯	◯	◯	◯	◯	◯	◯	◯
Fine-wire EMG placement	◯	◯	◯	◯	◯	◯	◯	◯
Data collection	◯	◯	◯	◯	◯	◯	◯	◯
Data reduction/analysis	◯	◯	◯	◯	◯	◯	◯	◯

	Never	Only at the opening of the lab	At least once a year	At least once each 2 years	At least once each 5 years	Randomly	Not used in my lab	Other
Data interpretation	◯	◯	◯	◯	◯	◯	◯	◯
Clinical recommendations	◯	◯	◯	◯	◯	◯	◯	◯
Other	◯	◯	◯	◯	◯	◯	◯	◯

Please specify

22. What time (in minutes) allocation do you allow for the following tasks related to the CGA? Please write down a number in scale 0 - 180 mins.

Appointment scheduling

Preparation of the lab

Physical exam

Subject preparation (marker, EMG placement)

Data collection

Data reduction/analysis

Creation of CGA report

Data interpretation and reporting

Other tasks, please specify

23. What are the physical dimensions of your gait lab? Size of room (in metres)

Length

Width

Height

24. Do your gait lab facilities include the following?

	Yes	No
Access for disabled patients	◯	◯
Controlled access for security purposes during patient assessment	◯	◯
A minimum 7 metre walking space for gait data collection	◯	◯
Room temperature adjustable thermostat	◯	◯
A quiet and non-distracting environment	◯	◯
A designated area where the patient can both change and be examined in privacy	◯	◯
Patient toilet facilities, including toilet for the disabled	◯	◯
Adequate seating facilities available for patients and families	◯	◯
Staff hand washing facilities	◯	◯
Non-slip, level and obstacle free floor	◯	◯
Daily floor cleaning	◯	◯
Examination couch and covers which are cleaned between each patient	◯	◯

Other facilities, please specify

25. Which equipment do you use for CGA and how much of each device do you use in your lab? Please type 0 if none.

Video camera

Stereophotogrammetric system with passive markers

Stereophotogrammetric system with active markers

Force plates

Surface electromyography

Fine-wire electromyography

Plantar pressure plate

Plantar pressure insoles

Inertial sensors

Oxygen consumption system

Activity monitor

GPS

Treadmill

Instrumented Treadmill

Other (please specify)

26. Which equipment used in your lab for CGA has a medical CE marking?

	Yes	No	I don't know	Not used in my lab
Video camera	◯	◯	◯	◯
Stereophotogrammetric system	◯	◯	◯	◯
Force plates	◯	◯	◯	◯

	Yes	No	I don't know	Not used in my lab
Electromyography	◯	◯	◯	◯
Fine-Wire Electromyography	◯	◯	◯	◯
Plantar pressure plate	◯	◯	◯	◯
Plantar pressure insoles	◯	◯	◯	◯
Inertial sensors	◯	◯	◯	◯
Oxygen consumption system	◯	◯	◯	◯
Activity monitor	◯	◯	◯	◯
GPS	◯	◯	◯	◯
Treadmill	◯	◯	◯	◯
Instrumented Treadmill	◯	◯	◯	◯

Other (please specify)

27. What is the measurement frequency in Hertz of acquisition of the equipment that you use in your lab for CGA? Please type 0 if not used in my lab.

Video camera

Stereophotogrammetric system

Force plates

Electromyography

Fine-Wire Electromyography

Plantar pressure plate

Plantar pressure insoles

Inertial sensors

Activity monitor

GPS

Instrumented Treadmill

Other (please specify)

28. Which of the following devices of your lab are synchronized to each other?

- [ ] Video camera
- [ ] Stereophotogrammetric system
- [ ] Force plates
- [ ] Surface Electromyography
- [ ] Fine-Wire Electromyography
- [ ] Plantar pressure plate
- [ ] Plantar pressure insoles
- [ ] Inertial sensors
- [ ] Oxygen consumption system
- [ ] Activity monitor
- [ ] GPS
- [ ] Treadmill
- [ ] Instrumented Treadmill
- [ ] Other (please specify)

29. How often do you collect the following datasets during CGA?

	Never	Sometimes	Regularly	Often	Always
Video footage	◯	◯	◯	◯	◯
Lower limb kinematics	◯	◯	◯	◯	◯
Lower limb kinetics	◯	◯	◯	◯	◯
Trunk and/or arm kinematics	◯	◯	◯	◯	◯
Foot multi-segment kinematics	◯	◯	◯	◯	◯
GRFs (video vector)	◯	◯	◯	◯	◯
Surface EMG	◯	◯	◯	◯	◯
Fine-wire EMG	◯	◯	◯	◯	◯
Plantar pressure	◯	◯	◯	◯	◯
Physical exam	◯	◯	◯	◯	◯
Questionnaires	◯	◯	◯	◯	◯
Inertial sensors	◯	◯	◯	◯	◯

	Never	Sometimes	Regularly	Often	Always
Oxygen consumption	◯	◯	◯	◯	◯

Please specify

30. Do you use additional measurements on top of the standard CGA for specific treatments and/or pathologies? If so, which ?

- [ ] Energy expenditure/Oxygen consumption
- [ ] Instrumented spasticity measurements
- [ ] Instrumented strength measurements (other than MMT and HHD)
- [ ] Muscle imaging
- [ ] Bone imaging
- [ ] Activity and participation questionnaires
- [ ] Extended marker configuration (i.e: Multisegment foot model)
- [ ] Upper limb assessments (specific tasks for the upper limb)
- [ ] Markerless tracking devices
- [ ] Pressure insoles
- [ ] None
- [ ] Other (please specify)

31. What is the minimal number of gait cycles that you consider it necessary to collect to satisfactorily interpret CGA for (please type 0 if none):

Spatio-temporal parameters

Kinematics

Kinetics

Surface EMG

Fine-wire EMG

Plantar pressure

32. Do an external company (e.g. the manufacturer) perform a technical calibration of the systems used for CGA?

	Never	Only at the opening of the lab	On specific request without an established review schedule	Once a year	Once two years	Not used in my lab
Video camera	◯	◯	◯	◯	◯	◯
Stereophotogrammetric system	◯	◯	◯	◯	◯	◯
Force plates	◯	◯	◯	◯	◯	◯
Surface electromyography	◯	◯	◯	◯	◯	◯
Fine-wire electromyography	◯	◯	◯	◯	◯	◯
Plantar pressure plate	◯	◯	◯	◯	◯	◯
Plantar pressure insoles	◯	◯	◯	◯	◯	◯
Inertial sensors	◯	◯	◯	◯	◯	◯
Oxygen consumption system	◯	◯	◯	◯	◯	◯
Activity monitor	◯	◯	◯	◯	◯	◯
GPS	◯	◯	◯	◯	◯	◯
Treadmill	◯	◯	◯	◯	◯	◯
Instrumented Treadmill	◯	◯	◯	◯	◯	◯
Other (please specify)	◯	◯	◯	◯	◯	◯

Please specify

33. Do an external company (e.g. the manufacturer) perform a quality control assessment of the systems used for CGA?

	Not used in my lab	Never	Only at the opening of the lab	On specific request without an established review schedule	Once a year	Once two years
Video camera	◯	◯	◯	◯	◯	◯
Stereophotogrammetric system	◯	◯	◯	◯	◯	◯
Force plates	◯	◯	◯	◯	◯	◯
Surface electromyography	◯	◯	◯	◯	◯	◯
Fine-wire electromyography	◯	◯	◯	◯	◯	◯
Plantar pressure plate	◯	◯	◯	◯	◯	◯
Plantar pressure insoles	◯	◯	◯	◯	◯	◯
Inertial sensors	◯	◯	◯	◯	◯	◯
Oxygen consumption system	◯	◯	◯	◯	◯	◯
Activity monitor	◯	◯	◯	◯	◯	◯
GPS	◯	◯	◯	◯	◯	◯
Treadmill	◯	◯	◯	◯	◯	◯
Instrumented Treadmill	◯	◯	◯	◯	◯	◯
Other	◯	◯	◯	◯	◯	◯

Please specify

34. Do you have documentation (written or electronic) in your CGA including the following

	Yes	No	Not relevant for my lab
List of current staff employed	◯	◯	◯
List of of training of the staff employed	◯	◯	◯
Protocol to install CGA equipment and software	◯	◯	◯
Protocol to check the quality of your CGA equipment	◯	◯	◯
Protocol to check within and between consistency of the staff - Methods to check consistency	◯	◯	◯
Protocol to check within and between consistency of the staff - Limit of acceptability	◯	◯	◯
Protocol for lab preparation - Calibration	◯	◯	◯
Protocol for lab preparation - Checking equipment	◯	◯	◯
Protocol for patient preparation - Marker placement	◯	◯	◯
Protocol for patient preparation - Marker attachment on the skin	◯	◯	◯
Protocol for patient preparation - Skin preparation for EMG	◯	◯	◯
Protocol for patient preparation - EMG placement	◯	◯	◯
Protocol for patient preparation - EMG attachment on the skin	◯	◯	◯
Protocol for patient preparation - IMU sensor placement/calibration/attachment on the skin	◯	◯	◯
Protocol for data collection - Instructions for patients	◯	◯	◯
Protocol for data collection - Tasks to collect	◯	◯	◯
Protocol for data collection - Number of trials/cycles	◯	◯	◯
Protocol for data collection - Number of cycles on forceplates	◯	◯	◯
Protocol for data collection - Checking of marker trajectories	◯	◯	◯
Protocol for data collection - Checking of EMG	◯	◯	◯
Protocol for data collection - Criteria to categorize a useful or not useful trial	◯	◯	◯
Protocol for data processing including methods and software - Event detection	◯	◯	◯
Protocol for data processing including methods and software - Spatio-temporal data	◯	◯	◯
Protocol for data processing including methods and software - 2D kinematics data	◯	◯	◯

Protocol for data processing including methods and software - Marker trajectory reconstruction (residual, gap filling, etc)	◯	◯	Not relevant for lab ◯
Protocol for data processing including methods and software - Marker labelling	◯	◯	◯
Protocol for data processing including methods and software - Marker filtering	◯	◯	◯
Protocol for data processing including methods and software - EMG (e.g. filtering techniques used, gait timing identification)	◯	◯	◯
Protocol for data processing including methods and software - 3D Kinematics data	◯	◯	◯
Protocol for data processing including methods and software - 3D Kinetics data	◯	◯	◯
Protocol for data processing including methods and software - Plantar Pressure data	◯	◯	◯
Biomechanical model used with potential sources of error in their calculation	◯	◯	◯
Protocol to check data quality	◯	◯	◯
Protocol for physical examination	◯	◯	◯
Protocol for reporting	◯	◯	◯
Protocol for interpretation	◯	◯	◯
Protocol for cleaning the equipment used in CGA	◯	◯	◯
Protocol for data storage (place,backed up, duration)	◯	◯	◯
Protocol for filenames and formats	◯	◯	◯
Protocole for safety procedures, serious adverse events occurring during CGA	◯	◯	◯

Other (please specify)

35. Are your documents...?

	Yes	No
Stored in a folder in the lab	◯	◯
Available in electronic format	◯	◯
Backed up	◯	◯
Revised after a defined period	◯	◯

36. In order to review your documents and your practice, does your lab have appointed auditors?

	Yes	No
Internal auditor	◯	◯
External auditor	◯	◯

37. Which equipment is checked before data acquisition?

	Yes	No	Not relevant (because I do not use this equipment)
Digital video quality	◯	◯	◯
Stereophotogrammetric system Calibration quality	◯	◯	◯
Presence of all stereophotogrammetric system markers	◯	◯	◯
Forceplates offset	◯	◯	◯
EMG - good signal for each muscle	◯	◯	◯
EMG - crosstalk	◯	◯	◯
Others	◯	◯	◯

Please specify

38. What do you check during data acquisition?

	Yes	No	Not relevant (because I do not use this equipment)
Visibility of stereophotogrammetric system markers trajectories	◯	◯	◯
Loss of EMG signal	◯	◯	◯
Noise of EMG signal (i.e. detachment of an electrode)	◯	◯	◯
Loss of forceplate signals	◯	◯	◯
Saturation of forceplate signals	◯	◯	◯
Foot placement on forceplate	◯	◯	◯
Others	◯	◯	◯

Please specify

39. What do you check before the patient leaves the lab?

	Yes	No	Not relevant (because I do not use this equipment)
Number of satisfactory forceplate strikes available for kinetic analysis	◯	◯	◯
Critical loss of markers	◯	◯	◯
Critical loss of EMG signal	◯	◯	◯
Critical loss of forceplate signals	◯	◯	◯
Other(s)	◯	◯	◯

Please specify

40. Do you perform other checks after data acquisition?

	Yes	No
Marker trajectories (quality, number of available trajectories)	◯	◯
EMG signal (quality, lost of signal, crosstalk)	◯	◯
Forceplate signal (quality, lost of signal, number of kinetic steps)	◯	◯
Other	◯	◯

Please specify

41. Do you do these steps for data preparation?

	Always	Sometimes	Never	I don't know	Device not used in my lab
Event detection with forceplates and autocorrelation	◯	◯	◯	◯	◯
Event detection with marker trajectories (e.g. Zeni et al. 2008)	◯	◯	◯	◯	◯

	Always	Sometimes	Never	I don't know	Device not used in my lab
Event detection performed manually	◯	◯	◯	◯	◯
Event detection checked manually	◯	◯	◯	◯	◯
Gap filling marker trajectories	◯	◯	◯	◯	◯
Smoothing marker trajectories	◯	◯	◯	◯	◯
Smoothing forceplate signals	◯	◯	◯	◯	◯
Filtering EMG signals	◯	◯	◯	◯	◯
Rectification and smoothing to obtain EMG envelope	◯	◯	◯	◯	◯

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Could you specify the method, the software and parameters used for data preparation?

42. Event detection

Method (e.g. Zeni et al. 2008) (text, 999 for I don't know)

Software (e.g. Nexus, QTM, Visual 3D, Matlab, Python, Mokka) (text, 999 for I don't know)

43. Gap filling

- Method (e.g. spline, rigid body, intercorrelation, Kalman filter) (text, 999 for I don't know)

Max gap size allowed (number, 999 for I don't know)

Software (e.g. Nexus, QTM, Visual 3D, Matlab, Python) (text, 999 for I don't know)

Other (text)

44. Smoothing marker trajectories

Method (e.g. low-pass filter, moving mean, polynomial interpolation) (text, 999 for I don't know)

Related cut-off frequency (e.g. 10Hz) (text, 999 for I don't know)

Software (e.g. Nexus, QTM, Visual 3D, Matlab, Python) (text, 999 for I don't know)

45. Smoothing forceplate signals

Method (e.g. low-pass filter, moving mean, polynomial interpolation) (text, 999 for I don't know)

Software (e.g. Nexus, QTM, Visual 3D, Matlab, Python) (text, 999 for I don't know)

Related cut-off frequency (e.g. 10Hz) (text, 999 for I don't know)

46. Filtering EMG signal

Filter (e.g. low-pass filter) (text, 999 for I don't know)

Related cut-off frequency (e.g. 6Hz) (text, 999 for I don't know)

Software used (e.g. Visual 3D, Matlab, Python) (text, 999 for I don't know)

47. Rectification and smoothing EMG signal (envelope)

Method used (Description - Reference) (text, 999 for I don't know)

Software used (e.g. Nexus, QTM, Visual 3D, Matlab, Python) (text, 999 for I don't know)

Parameter(s) of the method (e.g. Max gap size for gap filling, filter type and cut-off frequency for Smoothing)

48. Other

Method used (Description - Reference) (text, 999 for I don't know)

Software used (e.g. Nexus, QTM, Visual 3D, Matlab, Python) (text, 999 for I don't know)

Parameter(s) of the method (e.g. Max gap size for gap filling, filter type and cut-off frequency for Smoothing)

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49. For kinematics and kinetics computation, do you use the Conventional Gait Model (i.e. Plug-in-Gait) without any customisation?

- ◯ Always with wands on thigh and shank, without KAD (Knee Alignment device)
- ◯ Always with wands on thigh and shank, and KAD
- ◯ Always with markers on thigh and shank, without KAD (Knee Alignment device)
- ◯ Always with markers on thigh and shank, and KAD
- ◯ Sometimes
- ◯ Never
- ◯ I don't know
- ◯ Device not used in my lab

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50. Which methods do you use for kinematics and kinetics computation ?

	Always	Sometimes	Never	I don't know
CGM - With wands on thigh and shank	◯	◯	◯	◯
CGM - With markers on thigh and shank	◯	◯	◯	◯
CGM - With customisation (e.g. Internal knee markers)	◯	◯	◯	◯
Calibrated Anatomical System Technique – CAST	◯	◯	◯	◯
Istituto Ortopedico Rizzoli – IORGait	◯	◯	◯	◯
Human Body Model – HBM	◯	◯	◯	◯
Kinematics fitting (i.e. inverse kinematics, global optimisation, multibody kinematics optimisation)	◯	◯	◯	◯

Other (please specify)

51. Please specify the method to determine hip joint center

	Always	Sometimes	Never	I don't know
Predictive method (e.g. Bell 1990, Davis 1991, Harrington 2007, Hara 2016)	◯	◯	◯	◯
Functional calibration with specific movements (e.g. circumduction)	◯	◯	◯	◯
Functional calibration using gait trials	◯	◯	◯	◯
Ultrasound imaging	◯	◯	◯	◯

	Always	Sometimes	Never	I don't know
Other imaging techniques	◯	◯	◯	◯

Please specify reference of the method or other method (e.g. Predictive: Hara et al 2016)

52. Please specify the method to determine knee joint center/axis

	Always	Sometimes	Never	I don't know
Predictive method	◯	◯	◯	◯
Mid-distance between epicondyles	◯	◯	◯	◯
Chord function (Conventional Gait Model)	◯	◯	◯	◯
Knee Alignment Device (KAD)	◯	◯	◯	◯
Functional calibration with specific movements (e.g. squatting)	◯	◯	◯	◯
Functional calibration using gait trials (e.g. axis correction)	◯	◯	◯	◯
Ultrasound imaging	◯	◯	◯	◯

Please specify reference of the method or other method

53. Please specify the method to determine ankle joint center/axis

	Always	Sometimes	Never	I don't know
Predictive method	◯	◯	◯	◯
Mid-distance between malleoli	◯	◯	◯	◯
Chord function (Conventional Gait Model)	◯	◯	◯	◯
Functional calibration with specific movements	◯	◯	◯	◯
Functional calibration using gait trials	◯	◯	◯	◯
Ultrasound imaging	◯	◯	◯	◯
Other imaging techniques	◯	◯	◯	◯

Please specify reference of the method or other method

54. Please specify the method to determine body segment inertial parameters

	Always	Sometimes	Never	I don't know	No kinetics computation in my lab
From tables (e.g.	◯	◯	◯	◯	◯

	Always	Sometimes	Never	I don't know	No kinetics computation in my lab
Dempster, Zatsiorsky)					
Measured	◯	◯	◯	◯	◯

Specify reference

55. Which methods do you use for EMG computation?

	Always	Sometimes	Never	I don't know	Device not used in my lab
EMG envelopes are normalised by maximal voluntary contraction	◯	◯	◯	◯	◯
EMG envelopes are normalised by submaximal voluntary contraction	◯	◯	◯	◯	◯
EMG envelopes are normalised by a specific task	◯	◯	◯	◯	◯
EMG envelopes are normalised by a the maximum during the task	◯	◯	◯	◯	◯
Onset are detected (always, sometimes, never, I don't know)	◯	◯	◯	◯	◯

If you use a normalisation method,onset detection or other methods, specify a reference (text, 999 for I don't know)

56. Which methods used for data preparation and computation do you report in the technical report?

	Yes	No	Device not used in my lab
Event detection	◯	◯	◯
Marker trajectories - gap filling	◯	◯	◯
Marker trajectories - smoothing	◯	◯	◯
Forceplate - smoothing	◯	◯	◯
EMG - filtering	◯	◯	◯
EMG - rectification and smoothing	◯	◯	◯
EMG - normalization	◯	◯	◯
Spatiotemporal normalization	◯	◯	◯
Kinematic computations	◯	◯	◯
Kinetic computations	◯	◯	◯
Other	◯	◯	◯

if Other, please specify

57. Does the data presented in the report follow the following recommendations/standards?

	Completely	Partially	I don't know	Device not used in my lab
ISB recommendations for kinematics (Wu et al., 1995, 2002, 2005)	◯	◯	◯	◯
ISB recommendations for kinetics (Derrick et al., 2019)	◯	◯	◯	◯
ISEK Standards for Reporting EMG Data	◯	◯	◯	◯
Other standards	◯	◯	◯	◯

if Other, please specify

58. During CGA, do you perform the kinematics acquisition of the following body parts'on top of the lower limb and pelvis?

	Always	Sometimes	Never
Trunk	◯	◯	◯
Spine	◯	◯	◯
Head	◯	◯	◯
Arms	◯	◯	◯
Hands	◯	◯	◯
Foot (multi-segments)	◯	◯	◯

Other, please specify

59. Which software do you use for the biomechanical computation?

- ☐ Vicon software (Nexus, Workstation)
- ☐ Motion Analysis Corp software (Cortex)
- ☐ Codamotion software (Odin)
- ☐ Visual 3D
- ☐ OpenSim
- ☐ Matlab code developed by your lab
- ☐ Python code developed by your lab
- ☐ Matlab code available on a public repository - Bodymech (http://www.bodymech.nl/)
- ☐ Matlab code available on a public repository - Dumas - 3D Kinematics and Inverse Dynamics (https://ch.mathworks.com/matlabcentral/fileexchange/58021-3d-kinematics-and-inverse-dynamics)
- ☐ Python code available on a public repository - PyCGM2 (https://pycgm2.github.io/)
- ☐ Python code available on a public repository - PyCGM (https://github.com/cadop/pyCGM)
- ☐ Other, please specify

60. Do you use any of the below methodologies as part of your CGA and how often?

	Never	Sometimes	Regularly	Often	Always
OpenSim / Biomechanical modelling	◯	◯	◯	◯	◯
EMG analytics like muscle synergies	◯	◯	◯	◯	◯
Automated clinical reasoning	◯	◯	◯	◯	◯
Video-based human pose estimation software (such as OpenPose)	◯	◯	◯	◯	◯
Machine learning algorithms (such as DeepEvent)	◯	◯	◯	◯	◯
Other	◯	◯	◯	◯	◯

Please specify

61. Which software do you use to prepare the technical report?

- ☐ Vicon software (Polygon)
- ☐ Motion Analysis Corp software (Cortex)
- ☐ Codamotion software (Odin)
- ☐ Visual 3D
- ☐ Qualisys software (Clinical report)
- ☐ Moveshelf
- ☐ Matlab code developed by your lab
- ☐ Python code developed by your lab
- ☐ Other, please specify

62. What does your CGA report include?

	Yes	No
Technical report with data collected during CGA (graphs, ...)	◯	◯
Medical report with interpretation of the technical report	◯	◯
Multimedia report including video	◯	◯

63. Does your report include the following information?

	Yes	No
Name and date of birth of the patient on each	◯	◯

	Yes	No
page		
Identification of chief complaint or reason for study	◯	◯
Comprehensive clinical history	◯	◯
Documentation of past and current treatment	◯	◯
Description of the clinical exam	◯	◯
A consideration of the consistency of the patient's gait pattern, supported by data	◯	◯
Conditions under which data were collected (e.g. barefoot)	◯	◯
Patient compliance/co-operation	◯	◯
Comments on whether data are typical for the patient	◯	◯
Any problems or artefacts identified	◯	◯
Any corrections applied during data collection and processing	◯	◯
Functional diagnosis	◯	◯
Identification of Clinically Important Deviations/Abnormalities	◯	◯
Therapeutic recommendations	◯	◯
Staff member(s) responsible for the data acquisition	◯	◯
Staff member(s) responsible for the therapeutic recommendations	◯	◯
Signature of the staff/ designated signatory for lab	◯	◯
Other	◯	◯

Please specify

64. Does your report display the following data?

	Always	Sometimes	Never
Images of the patients at key points of the gait cycle	◯	◯	◯
Physical exam	◯	◯	◯
Spatio-temporal parameters as raw values	◯	◯	◯
Spatio-temporal parameters dimensionless (At Hof, 1996)	◯	◯	◯
Gait score - GGI -Gillette Gait Index	◯	◯	◯
Gait score - GDI - Gait Deviation Index	◯	◯	◯
Gait score - GPS - Gait Profile Score	◯	◯	◯
Gait score - MAP - Movement	◯	◯	◯

Analysis Profile	Always	Sometimes	Never
3D kinematics of the lower limbs	◯	◯	◯
3D kinematics of the foot (multi-segments)	◯	◯	◯
3D kinematics of the pelvis	◯	◯	◯
3D kinematics of the trunk	◯	◯	◯
3D kinematics of the arms	◯	◯	◯
3D kinematics of the head	◯	◯	◯
3D kinetics of the lower limbs	◯	◯	◯
3D ground reaction forces	◯	◯	◯
Only sagittal moments	◯	◯	◯
Internal joint moments	◯	◯	◯
External joint moments	◯	◯	◯
Distal joint moments	◯	◯	◯
Proximal joint moments	◯	◯	◯
Sagittal power of the lower limb	◯	◯	◯
3D powers of the lower limb	◯	◯	◯
Normalised kinematics cycle by cycle consistency	◯	◯	◯
Normalised kinematics - mean/SD	◯	◯	◯
Normalised kinetics cycle by cycle consistency	◯	◯	◯
Normalised kinetics - mean/SD	◯	◯	◯
Kinetics normalised by body weight	◯	◯	◯
Non-dimensional normalisation of kinetics	◯	◯	◯
Raw EMG	◯	◯	◯
Filtered EMG	◯	◯	◯
Envelop EMG	◯	◯	◯
Normative values for each graph displayed	◯	◯	◯
Plantar Pressure map	◯	◯	◯
Conditions of Testing Identified (e.g. barefoot, orthotic, prosthetic, shoes, assistive device, etc.)	◯	◯	◯
Identification of Right/Left sides	◯	◯	◯
Identification of Gait Cycle	◯	◯	◯

	Always	Sometimes	Never
Identification of Y-axis label	◯	◯	◯
Anatomic/Planar Orientation of Plots	◯	◯	◯
Normative Data Included on Plots and Clearly Identified	◯	◯	◯
Type of depicted data clearly identified (representative trial, multiple trials, mean of multiple trials, etc.)	◯	◯	◯
Clear identification of type of processing, if appropriate	◯	◯	◯
Muscles or muscle abbreviations clearly identified	◯	◯	◯
Other	◯	◯	◯

Please specify

65. If you report normative values these are

- ☐ No normative values are reported
- ☐ Collected in your lab
- ☐ Data published in the literature
- ☐ Age matched
- ☐ Speed matched
- ☐ Gender matched

66. Do you check your normal data against literature?

Yes	No
◯	◯

If yes, references used

67. How many subjects are included in total in the normative database?

0 — 1000

68. How do you identify gait deviations on the graphs of the report?

	Yes	No
Baker convention (Baker, Measuring walking - a Handbook of Clinical Gait Analysis)	◯	◯

	Yes	No
Comprehensive description	◯	◯
Other	◯	◯

Please specify

69. To whom is your CGA report delivered?

	Always	Sometimes	Never
To the referring professional	◯	◯	◯
To the patient	◯	◯	◯
Other	◯	◯	◯

Please specify

70. Which clinical data do you use in combination with 3D GA for decision making or follow up assessments?

	Always	Sometimes	Never
Specific functional standardized tools	◯	◯	◯
ROM assessment	◯	◯	◯
Strength assessment	◯	◯	◯
Selective motor control assessment	◯	◯	◯
Spasticity assessment	◯	◯	◯
Morphological deformities measurements	◯	◯	◯
Neurological examination	◯	◯	◯
Medical imaging	◯	◯	◯
Medical history	◯	◯	◯
Other	◯	◯	◯

Please specify

71. What information do you provide for the patients?

	Yes	No
An information sheet sent to patients referred for gait analysis	◯	◯
A satisfaction feedback survey	◯	◯

72. CGA raw data are stored

	Yes	No
On a local computer	◯	◯
On a server	◯	◯

	Yes	No
On a server with frequent backups	◯	◯
On the Patient File System (e.g. similar to PACS for imagery)	◯	◯

73. CGA processed data are stored

	Yes	No
On a local computer	◯	◯
On a server	◯	◯
On a server with frequent backups	◯	◯
On the Patient File System (e.g. similar to PACS for imagery)	◯	◯

74. CGA reports are stored

	Yes	No
On a local computer	◯	◯
On a server	◯	◯
On a server with frequent backups	◯	◯
On the Patient File System (e.g. similar to PACS for imagery)	◯	◯

75. What is the duration of the storage? Please enter a number of years.

Raw data	
Processed data	
Reports	

76. Comments:

PREV DONE