

Personal Information

Last name: Taylor
 First name: William R.
 Date of birth: 1st April 1972
 Email: bt@ethz.ch
 Position: Professor of Movement Biomechanics
 Institute for Biomechanics
 ETH Zürich



Professional career

2015 – 2017 Director, Institute for Biomechanics, ETH Zürich
 2013 – 2015 Vice Director, Institute for Biomechanics, ETH Zürich
 2012 – Present Professor for Movement Biomechanics, Institute for Biomechanics, ETH Zürich
 2006 – 2012 Head of Research Group „Functional Analysis“, Charité – Universitätsmedizin Berlin, Germany
 2000 – 2006 Postgraduate Scientific Research Officer, Charité – Universitätsmedizin Berlin, Germany
 1999 – 2000 Postdoctoral Research Officer, Biomechanics Research Lab, Prince of Wales Hospital, Sydney
 1999 Postdoctoral Research Officer, Sulzer Medica AG, Winterthur, Switzerland

Education

1995 – 1999 Ph.D. in Biomechanical Engineering from the University of Bath, UK
 1990 – 1994 Degree in Mechanical Engineering (B.Eng. Hons) from the University of Bath, UK

Selected Recent Projects as Leading Investigator

HMZ LOOP Zürich funding
 StimuLOOP: Precision sensorimotor neurorehabilitation through personalized stimulation loops
 Luft A, **Taylor WR**, Vogt J, Huber R, Gassert R
 Total project funding **5 mCHF** – value for LMB **814 kCHF** (1.9.2021 – 30.8.2026)

Innosuisse & Industrial research funding (Zimmer Biomet)
 Creation of Digital Patient Twins for optimal TKA implantation
Taylor WR, Seebeck J, Vogl F, Schütz P
 Total project funding **CHF 1'000'868** (1.5.2021 – 33.4.2024)

Singapore ETH Centre (SEC), Singapore
 “Future Health Technologies”
 PI Module 1: **Taylor WR**
 Total project funding **50mSGD** - value for Module 1 ca. **11 mCHF** (1.3.2020 – 29.2.2025)

Industrial research funding
 Ear mounted sensors for assessing fall risk
 Singh NB, Ravi D, **Taylor WR**
 Total project funding **CHF 836'000** (1.2.2020 – 31.1.2024)

SNF Research Funding (Division II)
Stretching the Limits of In Vivo Measurement: A wireless implantable sensor technology to quantify soft tissue strain during dynamic movements
Taylor WR, Smith C
 Total project funding **CHF 562'126** (1.12.2018 – 30.11.2021)

Research funding from Invacare International
Postural control and control through posture: Embodied interaction and integrated therapies in wheelchairs
Taylor WR, Zemp R
 Total project funding **CHF 352'193** (1.9.2018 – 30.8.2021)

FHT Pre-initiative grant
Taylor WR, Singh NB
 Total project funding **CHF 100'000** (1.10.2018 – 30.9.2019)

SNF R'Equip equipment grant (Nr. 177170)

Dynamic dual-plane video-fluoroscopy for driving critical research in Musculoskeletal Biomechanics

Taylor WR

Total project funding **CHF 401'831** (1.12.2017 – 31.11.2018)

ETH Research Grant (ETH-18 16-2)

The MouseGait Project: Stretchable electronics based on pressure sensor arrays for quantitative characterisation of rodent gait and function

Taylor WR, Vörös J

(1.4.2017 – 31.3.2020)

Total project funding **CHF 390'800**

Research grant funded by Wings for Life

ZürichMOVE: Wireless sensor technology to enrich assessments and outcome measures for clinical trials

Curt A, Gassert R, **Taylor WR**

Total project funding **€264'000** (1.7.2016 – 30.5.2018)

Research Grant funded by the Commission for Technology and Innovation (CTI)

Sitting Categorisation Technology for Wheelchair Users to prevent Pressure Ulcers

Taylor WR, Curt A, Adelsberger R, Plaschko R, Zemp R

Total project funding **CHF 286'473** (1.9.2016 - 31.8.2018)

ZurichMOVE: a multi-center collaborative project for developing and establishing protocols and algorithms to accurately quantify upper limb kinematics in wheel-chair patients with spinal cord surgery.

Curt A, Gassert, R, **Taylor WR**

Total project funding **CHF 100'000** (1.1.2016 - 31.12.2016)

Research Grant funded by the Commission for Technology and Innovation (KTI no. 17078.1 PFLS-LS)

Proof of concept for medial stability in the GMK Sphere knee prosthesis in vivo

List R, Schütz P, **Taylor WR**

Total project funding **CHF 249'782** (1.9.2014 - 31.0.2017)

Research Grant funded by Medacta International S.A.

Understanding GMK Sphere implant tibio-femoral kinematics by means of dynamic video-fluoroscopy

List R, **Taylor WR**

Total project funding **CHF 250'000** (1.9.2014 - 31.08.2017)

Research Grant awarded by the Robert Mathys Foundation

Non-invasive assessment of bone structural properties

Taylor WR

Total project funding **CHF 120'000** (1.1.2014 - 31.12.2016)

Editorial Board Member

2015 – present	Editorial Board member in Journal “Functional Morphology and Kinesiology”
2014 – present	Editorial Board member in Journal “Geriatrics”
2011 – present	Editorial Board member in Journal “International Journal of Digital Human”
2010 – present	Editorial board member in Journal “Medical Engineering and Physics”

Selected Honours

Clinical Biomechanics Award for ISB Best Paper (Postolka et al. 2021)

Elected as a 2021 Fellow of the EAMBES society

European Society of Biomechanics SM Perren award for best scientific paper 2014

Deutsche Gesellschaft für Orthopädie und Unfallchirurgie Grundlagenforschungspreis 2013

ORMED GmbH Prize for best paper presentation 2011

AXIS prize for clinical research in orthopaedics and trauma surgery 2009

Other Contributions

Served as Vice President and Treasurer of the European Society of Biomechanics (2008-2016)

ETH representative for Gender and Racial Equality

Executive board and Representative of the ETH Department D-HEST on the Teaching Commission

(Kommission des Lehrkörpers, KdL)

Member of the ETH University Assembly

Member of ETH Ethics Commission

Publications

Researcher ID:	F-8692-2010
Total no. of peer-reviewed publications:	over 160
H-index:	Web of Science 32 / 44 Google Scholar
Citations:	Web of Science >3900 / >6900 Google Scholar
ORCID:	https://orcid.org/0000-0003-4060-4098

Recent Publications 2017 - 2021

2021

1. Ravi DK, Heimhofer CC, **Taylor WR**, Singh NB.
Adapting Footfall Rhythmicity to Auditory Perturbations Affects Resilience of Locomotor Behavior: A Proof-of- Concept Study.
Front Neurosci. 2021 Jul 29;15:678965. doi: 10.3389/fnins.2021.678965.
2. Roth T, Rahm S, Jungwirth-Weinberger A, Süess J, Sutter R, Schellenberg F, **Taylor WR**, Snedeker JG, Widmer J, Zingg P.
Restoring range of motion in reduced acetabular version by increasing femoral antetorsion - What about joint load?
Clin Biomech (Bristol, Avon). 2021 Jul;87:105409. doi: 10.1016/j.clinbiomech.2021.105409.
3. Nasab SHH, Smith CR, Postolka B, Schütz P, List R, **Taylor WR**.
In Vivo Elongation Patterns of the Collateral Ligaments in Healthy Knees During Functional Activities.
J Bone Joint Surg Am. 2021 Apr 12. doi: 10.2106/JBJS.20.01311.
4. Boeth H, Biesen R, Hollnagel J, Herrmann S, Ehrig RM, Pelli L, **Taylor WR**, Duda GN, Buttgerit F.
Quantification of morning stiffness to assess disease activity and treatment effects in rheumatoid arthritis.
Rheumatology (Oxford). 2021 Apr 5:keab323. doi: 10.1093/rheumatology/keab323.
5. Visscher RMS, Sangiri S, Freslier M, Harlaar J, Brunner R, **Taylor WR**, Singh NB.
Towards validation and standardization of automatic gait event identification algorithms for use in paediatric pathological populations.
Gait Posture. 2021 May;86:64-69. doi: 10.1016/j.gaitpost.2021.02.031.
6. Visscher R, Hasler N, Freslier M, Singh NB, **Taylor WR**, Brunner R, Rutz E.
Long-term follow-up after multilevel surgery in cerebral palsy.
Arch Orthop Trauma Surg. 2021 Feb 23. doi: 10.1007/s00402-021-03797-0.
7. Ravi DK, Bartholet M, Skiadopoulos A, Kent JA, Wickstrom J, **Taylor WR**, Singh NB, Stergiou N.
Rhythmic auditory stimuli modulate movement recovery in response to perturbation during locomotion.
J Exp Biol. 2021 Mar 1;224(Pt 5):jeb237073. doi: 10.1242/jeb.237073.
8. Zhang Q, Adam NC, Hosseini Nasab SH, **Taylor WR**, Smith CR.
Techniques for In Vivo Measurement of Ligament and Tendon Strain: A Review.
Ann Biomed Eng. 2021 Jan;49(1):7-28. doi: 10.1007/s10439-020-02635-5.
9. Hubli M, Zemp R, Albisser U, Camenzind F, Leonova O, Curt A, **Taylor WR**.
Feedback improves compliance of pressure relief activities in wheelchair users with spinal cord injury.
Spinal Cord. 2021 Feb;59(2):175-184. doi: 10.1038/s41393-020-0522-7.

2020

10. Ravi DK, Marmelat V, **Taylor WR**, Newell KM, Stergiou N, Singh NB.
Assessing the Temporal Organization of Walking Variability: A Systematic Review and Consensus Guidelines on Detrended Fluctuation Analysis.
Front Physiol. 2020 Jun 23;11:562. doi: 10.3389/fphys.2020.00562.
11. Hosseini Nasab SH, Smith C, Schütz P, Postolka B, Ferguson S, **Taylor WR**, List R.
Elongation Patterns of the Posterior Cruciate Ligament after Total Knee Arthroplasty.
J Clin Med. 2020 Jul 2;9(7):2078. doi: 10.3390/jcm9072078.
12. Vogl F, Greger S, Favre P, **Taylor WR**, Thistlethwaite P.
Differentiation between mechanically loose and fixed press-fit implants using quantitative acoustics and load self-referencing: A phantom study on shoulder prostheses in polyurethane foam.
PLoS One. 2020 May 29;15(5):e0233548. doi: 10.1371/journal.pone.0233548.
13. Postolka B, Schütz P, Fucentese SF, Freeman MAR, Pinskerova V, List R, **Taylor WR**.
Tibio-femoral kinematics of the healthy knee joint throughout complete cycles of gait activities.
J Biomech. 2020 Sep 18;110:109915. doi: 10.1016/j.jbiomech.2020.109915.
14. Sayers MGL, Hosseini Nasab SH, Bachem C, **Taylor WR**, List R, Lorenzetti S.
The effect of increasing heel height on lower limb symmetry during the back squat in trained and novice lifters.
BMC Sports Sci Med Rehabil. 2020 Jul 25;12:42. doi: 10.1186/s13102-020-00191-y.
15. Hosseini Nasab SH, Smith C, Schütz P, Postolka B, Ferguson S, **Taylor WR**, List R.
Elongation Patterns of the Posterior Cruciate Ligament after Total Knee Arthroplasty.
J Clin Med. 2020 Jul 2;9(7):2078. doi: 10.3390/jcm9072078.
16. Renggli D, Graf C, Tachatos N, Singh N, Meboldt M, **Taylor WR**, Stieglitz L, Schmid Daners M.
Wearable Inertial Measurement Units for Assessing Gait in Real-World Environments.

Front Physiol. 2020 Feb 20;11:90. doi: 10.3389/fphys.2020.00090.

17. Imani Nejad Z, Khalili K, Hosseini Nasab SH, Schütz P, Damm P, Trepczynski A, **Taylor WR**, Smith CR.
Correction to: The Capacity of Generic Musculoskeletal Simulations to Predict Knee Joint Loading Using the CAMS-Knee Datasets.
Ann Biomed Eng. 2020 Apr;48(4):1442. doi: 10.1007/s10439-020-02480-6.
18. Lorenzetti S, Ostermann M, Zeidler F, Zimmer P, Jentsch L, List R, **Taylor WR**, Schellenberg F.
Correction to: How to squat? Effects of various stance widths, foot placement angles and level of experience on knee, hip and trunk motion and loading.
BMC Sports Sci Med Rehabil. 2020 Jan 29;12:7. doi: 10.1186/s13102-020-0160-6. eCollection 2020.
19. Imani Nejad Z, Khalili K, Hosseini Nasab SH, Schütz P, Damm P, Trepczynski A, **Taylor WR**, Smith CR.
The Capacity of Generic Musculoskeletal Simulations to Predict Knee Joint Loading Using the CAMS-Knee Datasets.
Ann Biomed Eng. 2020 Apr;48(4):1430-1440. doi: 10.1007/s10439-020-02465-5. Epub 2020 Jan 30.
20. Postolka B, List R, Thelen B, Schütz P, **Taylor WR**, Zheng G.
Evaluation of an intensity-based algorithm for 2D/3D registration of natural knee videofluoroscopy data.
Med Eng Phys. 2020 Mar;77:107-113. doi: 10.1016/j.medengphy.2020.01.002.
21. Hosseini Nasab SH, Smith CR, Schütz P, Damm P, Trepczynski A, List R, **Taylor WR**.
Length-Change Patterns of the Collateral Ligaments During Functional Activities After Total Knee Arthroplasty.
Ann Biomed Eng. 2020 Apr;48(4):1396-1406. doi: 10.1007/s10439-020-02459-3.

2019

22. Hosseini Nasab SH, Smith CR, Schütz P, Postolka B, List R, **Taylor WR**.
Elongation Patterns of the Collateral Ligaments After Total Knee Arthroplasty Are Dominated by the Knee Flexion Angle.
Front Bioeng Biotechnol. 2019 Nov 12;7:323. doi: 10.3389/fbioe.2019.00323.
23. Ravi DK, Gwerder M, König Ignasiak N, Baumann CR, Uhl M, van Dieën JH, **Taylor WR**, Singh NB.
Revealing the optimal thresholds for movement performance: A systematic review and meta-analysis to benchmark pathological walking behaviour.
Neurosci Biobehav Rev. 2020 Jan;108:24-33. doi: 10.1016/j.neubiorev.2019.10.008.
24. Bontrup C, **Taylor WR**, Fliesser M, Visscher R, Green T, Wippert PM, Zemp R.
Low back pain and its relationship with sitting behaviour among sedentary office workers.
Appl Ergon. 2019 Nov;81:102894. doi: 10.1016/j.apergo.2019.102894.
25. Vogl F, Patil M, **Taylor WR**.
Sensitivity of low-frequency axial transmission acoustics to axially and azimuthally varying cortical thickness: A phantom-based study.
PLoS One. 2019 Jul 17;14(7):e0219360. doi: 10.1371/journal.pone.0219360. eCollection 2019.
26. Schütz P, **Taylor WR**, Postolka B, Fucetese SF, Koch PP, Freeman MAR, Pinskerova V, List R.
Kinematic Evaluation of the GMK Sphere Implant During Gait Activities: A Dynamic Videofluoroscopy Study.
J Orthop Res. 2019 Nov;37(11):2337-2347. doi: 10.1002/jor.24416. Epub 2019 Aug 7.
27. Orter S, Ravi DK, Singh NB, Vogl F, **Taylor WR**, König Ignasiak N.
A method to concatenate multiple short time series for evaluating dynamic behaviour during walking.
PLoS One. 2019 Jun 21;14(6):e0218594. doi: 10.1371/journal.pone.0218594. eCollection 2019.
28. Reissner L, Fischer G, List R, **Taylor WR**, Giovanoli P, Calcagni M.
Minimal detectable difference of the finger and wrist range of motion: comparison of goniometry and 3D motion analysis.
J Orthop Surg Res. 2019 Jun 10;14(1):173. doi: 10.1186/s13018-019-1177-y.
29. König Ignasiak N, Ravi DK, Orter S, Hosseini Nasab SH, **Taylor WR**, Singh NB.
Does variability of footfall kinematics correlate with dynamic stability of the centre of mass during walking?
PLoS One. 2019 May 31;14(5):e0217460. doi: 10.1371/journal.pone.0217460. eCollection 2019.
30. Huber C, Zhang Q, **Taylor WR**, Amis AA, Smith C, Hosseini Nasab SH.
Properties and Function of the Medial Patellofemoral Ligament: A Systematic Review.
Am J Sports Med. 2020 Mar;48(3):754-766. doi: 10.1177/0363546519841304.
31. Trepczynski A, Kutzner I, Schütz P, Dymke J, List R, von Roth P, Moewis P, Bergmann G, **Taylor WR**, Duda GN.
Author Correction: Tibio-Femoral Contact Force Distribution is Not the Only Factor Governing Pivot Location after Total Knee Arthroplasty.
Sci Rep. 2019 Apr 11;9(1):6188. doi: 10.1038/s41598-019-41668-2.
32. Schütz P, Postolka B, Gerber H, Ferguson SJ, **Taylor WR**, List R.
Knee implant kinematics are task-dependent.
J R Soc Interface. 2019 Feb 28;16(151):20180678. doi: 10.1098/rsif.2018.0678.
33. Zemp R, Rhiner J, Plüss S, Togni R, Plock JA, **Taylor WR**.
Wheelchair Tilt-in-Space and Recline Functions: Influence on Sitting Interface Pressure and Ischial Blood Flow in an Elderly Population.
Biomed Res Int. 2019 Mar 6;2019:4027976. doi: 10.1155/2019/4027976. eCollection 2019.
34. Vogl F, Friesenbichler B, Hüsken L, Kramers-de Quervain IA, **Taylor WR**.
Can low-frequency guided waves at the tibia paired with machine learning differentiate between healthy and

osteopenic/osteoporotic subjects? A pilot study.
Ultrasonics. 2019 Apr;94:109-116. doi: 10.1016/j.ultras.2018.11.012.

35. Trepczynski A, Kutzner I, Schütz P, Dymke J, List R, von Roth P, Moewis P, Bergmann G, **Taylor WR**, Duda GN.
Tibio-Femoral Contact Force Distribution is Not the Only Factor Governing Pivot Location after Total Knee Arthroplasty.
Sci Rep. 2019 Jan 17;9(1):182. doi: 10.1038/s41598-018-37189-z.

2018

36. Häberle R, Schellenberg F, List R, Plüss M, **Taylor WR**, Lorenzetti S.
Comparison of the kinematics and kinetics of shoulder exercises performed with constant and elastic resistance.
BMC Sports Sci Med Rehabil. 2018 Nov 28;10:22. doi: 10.1186/s13102-018-0111-7. eCollection 2018.
37. Schellenberg F, **Taylor WR**, Trepczynski A, List R, Kutzner I, Schütz P, Duda GN, Lorenzetti S.
Evaluation of the accuracy of musculoskeletal simulation during squats by means of instrumented knee prostheses.
Med Eng Phys. 2018 Nov;61:95-99. doi: 10.1016/j.medengphy.2018.09.004. Epub 2018 Sep 30.
38. Lorenzetti S, Ostermann M, Zeidler F, Zimmer P, Jentsch L, List R, **Taylor WR**, Schellenberg F.
How to squat? Effects of various stance widths, foot placement angles and level of experience on knee, hip and trunk motion and loading.
BMC Sports Sci Med Rehabil. 2018 Jul 17;10:14. doi: 10.1186/s13102-018-0103-7. eCollection 2018.
39. Hitz M, Schütz P, Angst M, **Taylor WR**, List R.
Influence of the moving fluoroscope on gait patterns.
PLoS One. 2018 Jul 13;13(7):e0200608. doi: 10.1371/journal.pone.0200608. eCollection 2018.
40. Plüss M, Schellenberg F, **Taylor WR**, Lorenzetti S.
Towards Subject-Specific Strength Training Design through Predictive Use of Musculoskeletal Models.
Appl Bionics Biomech. 2018 Mar 19;2018:9721079. doi: 10.1155/2018/9721079. eCollection 2018.
41. Agres AN, Gehlen TJ, Arampatzis A, **Taylor WR**, Duda GN, Manegold S.
Short-term functional assessment of gait, plantarflexor strength, and tendon properties after Achilles tendon rupture.
Gait Posture. 2018 May;62:179-185. doi: 10.1016/j.gaitpost.2018.03.007.

2017

42. König Ignasiak N, Habermacher L, **Taylor WR**, Singh NB.
Cortical Contribution to Linear, Non-linear and Frequency Components of Motor Variability Control during Standing.
Front Hum Neurosci. 2017 Nov 10;11:548. doi: 10.3389/fnhum.2017.00548. eCollection 2017.
43. **Taylor WR**, Schütz P, Bergmann G, List R, Postolka B, Hitz M, Dymke J, Damm P, Duda G, Gerber H, Schwachmeyer V, Hosseini Nasab SH, Trepczynski A, Kutzner I.
A comprehensive assessment of the musculoskeletal system: The CAMS-Knee data set.
J Biomech. 2017 Dec 8;65:32-39. doi: 10.1016/j.jbiomech.2017.09.022.
44. List R, Postolka B, Schütz P, Hitz M, Schwilch P, Gerber H, Ferguson SJ, **Taylor WR**.
A moving fluoroscope to capture tibiofemoral kinematics during complete cycles of free level and downhill walking as well as stair descent.
PLoS One. 2017 Oct 9;12(10):e0185952. doi: 10.1371/journal.pone.0185952. eCollection 2017.
45. Baker ML, Epari DR, Lorenzetti S, Sayers M, Boutellier U, **Taylor WR**.
Risk Factors for Knee Injury in Golf: A Systematic Review.
Sports Med. 2017 Dec;47(12):2621-2639. doi: 10.1007/s40279-017-0780-5.
46. Vogl F, Bernet B, Bolognesi D, **Taylor WR**.
Towards assessing cortical bone porosity using low-frequency quantitative acoustics: A phantom-based study.
PLoS One. 2017 Sep 7;12(9):e0182617. doi: 10.1371/journal.pone.0182617. eCollection 2017.
47. List R, Hitz M, Angst M, **Taylor WR**, Lorenzetti S.
In-situ force plate calibration: 12 years' experience with an approach for correcting the point of force application.
Gait Posture. 2017 Oct;58:98-102. doi: 10.1016/j.gaitpost.2017.07.111.
48. Schellenberg F, **Taylor WR**, Lorenzetti S.
Towards evidence based strength training: a comparison of muscle forces during deadlifts, goodmornings and split squats.
BMC Sports Sci Med Rehabil. 2017 Jul 17;9:13. doi: 10.1186/s13102-017-0077-x. eCollection 2017.
49. Oberhofer K, Hosseini Nasab SH, Schütz P, Postolka B, Snedeker JG, **Taylor WR**, List R.
The influence of muscle-tendon forces on ACL loading during jump landing: a systematic review.
Muscles Ligaments Tendons J. 2017 May 10;7(1):125-135. doi: 10.11138/mltj/2017.7.1.125.
50. Rumberg F, Bakir MS, **Taylor WR**, Haberl H, Sarpong A, Sharankou I, Lebek S, Funk JF.
Correction: The Effects of Selective Dorsal Rhizotomy on Balance and Symmetry of Gait in Children with Cerebral Palsy.
PLoS One. 2017 May 8;12(5):e0177585. doi: 10.1371/journal.pone.0177585. eCollection 2017.
51. Schellenberg F, Schmid N, Häberle R, Hörterer N, **Taylor WR**, Lorenzetti S.
Loading conditions in the spine, hip and knee during different executions of back extension exercises.
BMC Sports Sci Med Rehabil. 2017 Apr 24;9:10. doi: 10.1186/s13102-017-0074-0. eCollection 2017.
52. Schmid S, Bruhin B, Ignasiak D, Romkes J, **Taylor WR**, Ferguson SJ, Brunner R, Lorenzetti S.
Spinal kinematics during gait in healthy individuals across different age groups.
Hum Mov Sci. 2017 Aug;54:73-81. doi: 10.1016/j.humov.2017.04.001.

53. Baaklini E, Angst M, Schellenberg F, Hitz M, Schmid S, Tal A, **Taylor WR**, Lorenzetti S.
High-heeled walking decreases lumbar lordosis.
Gait Posture. 2017 Jun;55:12-14. doi: 10.1016/j.gaitpost.2017.03.035.
54. Schellenberg F, **Taylor WR**, Jonkers I, Lorenzetti S.
Robustness of kinematic weighting and scaling concepts for musculoskeletal simulation.
Comput Methods Biomech Biomed Engin. 2017 May;20(7):720-729. doi: 10.1080/10255842.2017.1295305.
55. König N, Ferraro MG, Baur H, **Taylor WR**, Singh NB.
What Is the Contribution of Ia-Afference for Regulating Motor Output Variability during Standing?
Front Hum Neurosci. 2017 Mar 2;11:87. doi: 10.3389/fnhum.2017.00087. eCollection 2017.

ZurichMOVE (www.ZurichMOVE.com): in partnership with Prof Roger Gassert (ETH D-HEST) and Prof Armin Curt (USZ, University hospital Balgrist), we have created state-of-the-art inertial sensor units that combine highly accurate inertial sensors into a unique system that allows the synchronous, wireless measurement and storage of raw data from multiple sensors. The system allows high-frequency, high-precision measurements of body orientation and acceleration for improving assessment of movement quality for clinical screening, as well as low-frequency measurements for monitoring movement quantity and long-term motor function in non-laboratory environments. Having been awarded grants from HMZ (Hochschule Medizin Zürich) and Wings-for-life to further develop and translate the modules, we now aim to use the modules in clinical settings for the assessment of movement performance in wheelchair users, as well as the early identification and monitoring of movement deficits in patients with neuromotor deficits.

CAMS-Knee Project: In a collaborative partnership with Charité–Universitätsmedizin Berlin (Germany) – in the so-called Comprehensive Assessment of the Musculoskeletal System (CAMS-Knee) project - we have been able to synchronously measure the internal joint contact forces at the knee in 6 telemetry patients, together with the skeletal kinematics using the ETH Zürich moving fluoroscope. In addition, whole body kinematics, external ground reaction forces and muscle EMG were measured during complete cycles of walking, stair descent and ramp descent. These unique datasets are now being used for scientific research and publication and, after a proprietary period of 2 years, the complete raw datasets will be released worldwide and made freely available to provide all researchers in the fields of biomechanics and orthopaedics a reliable and highly accurate resource for model validation and investigation of the knee joint. The first sample datasets are now available on <https://cams-knee.orthoload.com/>

Moving Fluoroscope: In collaboration with Prof Ferguson (IfB, ETH Zürich) the further development, construction and application of the moving fluoroscope has allowed a number of unique studies to be performed into understanding the kinematics of the knee joint throughout complete cycles of activities of daily living. Specifically, the investigation of joint stability in the knee has led to an enhancement of the GMK Sphere total replacement knee implant, which is able to provide medial stability to the tibio-femoral joint, while allowing freedom of movement to the knee by permitting motion at the lateral condyle. This project now forms the baseline for ongoing collaborative projects with Medacta International. The second generation dual-plane fluoroscope is now being designed and constructed for application within the new laboratory, for initiation in 2021.

Implementation of Movement Algorithms within Commercial Software: After the scientific development of algorithms to determine the centre and axis of rotation of human joints during functional activities, a collaborative effort with Vicon (OMG, Oxford, UK) has allowed the Symmetrical Centre of Rotation Estimation (SCoRE) and Symmetrical Axis of Rotation (SARA) approaches to be made globally available for use in motion analysis within the NEXUS software. These approaches have thereby become internationally well known in the field, and now support approaches for soft tissue artefact reduction and joint centre determination, towards improved musculoskeletal models for understanding the relationships between movement and loading within the human body.