Kevin Mattheus Moerman

Computational Biomechanics & Design Engineer

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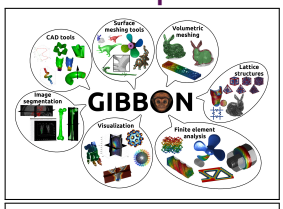
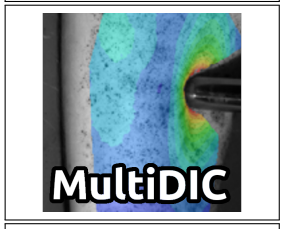
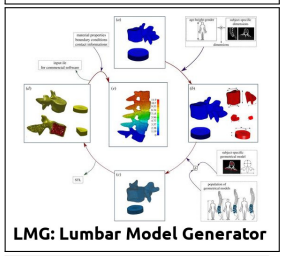
Software development







Programming

MATLAB ★★★★★
Octave ★★★★★
Julia ★★★☆☆
LABVIEW ★★★☆☆
Git/GitHub ★★★★☆
LaTeχ ★★★★★
MarkDown ★★★★★
HTML ★★★★☆

CAD & FEA

FEBio ★★★★★
ABAQUS ★★★★☆
FreeCAD ★★★★★
PTC/Creo ★★★★★
Inventor ★★★☆☆

Robotics

References

Prof. Peter McHugh
Dr. Patrick McGarry
Prof. Aart Nederveen
Prof. Ciaran Simms

Experience

07/2019-Now — **Lecturer Biomedical Engineering** — Biomedical Engineering, NUIG, Galway, Ireland
Responsibilities include teaching undergraduate/postgraduate modules (e.g. Comp. Methods in Eng. Analysis, and Advanced FEA), and supervision of (under)graduate students. Research: computational biomechanics and medical device optimization.

08/2018-Now — **Research Affiliate** — Biomechatronics, MIT Media Lab, Cambridge, MA, USA
Continued collaboration on computational mechanics and device design. Guidance and training of new staff for NIH RO1 clinical trial of prosthetic sockets.

08/2018-07/2019 — **Research Fellow** — Biomedical Engineering, NUIG, Galway, Ireland
The core research focussed on the development of computational tools for in-silico trials of mechanical thrombectomy. Other responsibilities include PhD student guidance and teaching of the module: *Engineering Analysis for Regulatory Approval*.

04/2017-08/2018 — **Research Scientist** — Biomechatronics, MIT Media Lab, Cambridge, MA, USA
Leader of the *Computational Biomechanics* research track, which focusses on the development of novel computational (and experimental) methods to study tissue biomechanics, and to design devices that interact with tissue. Responsibilities: grant writing, co-supervision of (under)graduate students.

09/2015-04/2017 — **Post Doctoral Associate** — Biomechatronics, MIT Media Lab, Cambridge, MA, USA
Development of a framework for automated design and optimization of subject-specific prosthetic sockets. Leader of the *Computational Biomechanics* research track. Responsibilities: grant writing, co-supervision of (under)graduate students.

01/2015-09/2015 — **Research Affiliate** — Biomechatronics, MIT Media Lab, Cambridge, MA, USA
Development of computational design methods for prosthetic devices. Co-supervisor and co-promotor for a PhD student.

04/2013-2018 — **Visiting Research Fellow** — University of Dublin, Trinity College, Dublin, Ireland
Collaboration on computational biomechanics, inverse finite element analysis, and the use of the GIBBON toolbox.

2011 - 2015 — **Post Doctoral Research Fellow** — Academic Medical Centre, Amsterdam, The Netherlands
Development of novel methods for non-invasive analysis of soft tissue mechanical properties (and pressure ulcers) based on inversion of Magnetic Resonance Elastography data, SPAMM tagged MRI, and inverse finite element analysis.

2003 - 2006 — **Design Engineer** — Lely Technologies N.V., Maassluis, The Netherlands
Design and development of agricultural robotic systems, e.g. a robotic feed pusher and a solar energy powered mobile feeding robot.

Education

08/2019-Now — **PgCert in Teaching and Learning in Higher Education** — NUIG, Galway, Ireland

05/2017-06/2017 — **Kaufman Teaching Certificate Program** — MIT, Cambridge, USA

02/2013-04/2013 — **Course: Advanced MR Physics** — Universiteit Utrecht, Utrecht, The Netherlands

08/2006-02/2012 — **PhD in Bioengineering** — University of Dublin, Trinity College, Dublin, Ireland
Thesis: *An Improved Framework for the Inverse Analysis of Skeletal Muscle Tissue In-vivo*

08/2008-08/2009 — **Postgraduate Diploma in Statistics** — University of Dublin, Trinity College, Dublin, Ireland

09/2006 — **Course: Advances in Continuum Mechanics** — Durham University, Durham, UK
Mathematics for Engineers EPSRC Summer School: *Advances in Continuum Mechanics, The Nonlinear Deformation of Solids*.

2004 - 2005 — **MSc in Bioengineering** — University of Dublin, Trinity College, Dublin, Ireland
Thesis: *A Finite Element Model of the Human Head to Predict and Analyse Brain Injury due to Blast-Induced Acceleration*

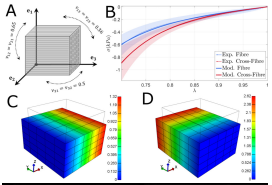
2000 - 2004 — **BEng in Mechanical Engineering** — The Hague University of Appl. Sciences, The Hague, NL
Major: *Product Design*. Final Project: *"The Design and Development of an Autonomic Solar Powered, Mobile Concentrate Feeding Robot for Cows"*.

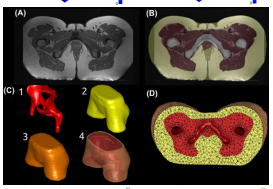
Patents

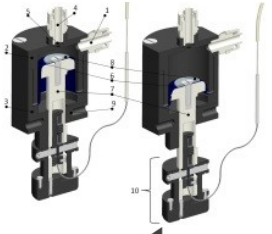
US20190021880A1

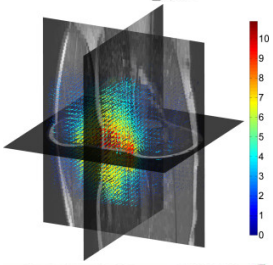
EP1683411

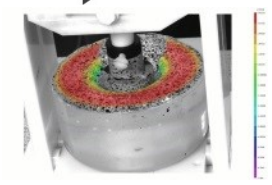
Publication figures











Languages

English ★★★★★
Dutch ★★★★★
German ★★☆☆☆

Membership

Senior Member IEEE
Euro. Soc. for Biomech.
Open Source Initiative

Awards & Grants

2021 **Research grant: €265,532 (LERO/SFI Platform grant)** LERO SFI research centre
Moerman KM (PI), Margaria T.(PI), *An MDD Platform for Automated Computational Design and Optimization of Prosthetic Sockets.*

2017 **Research grant: $1,600,000 (R01 EB024531-01)** USA National Institute of Health
Herr HM. (PI), Moerman KM.(Key Person), *Computational Design, Fabrication, and Evaluation of Optimized Patient-Specific Transtibial Prosthetic Sockets.*

2013 **Research grant: €710,500 (STW 12398)** Netherlands Organisation for Scientific Research
Oomens C.(PI), Nederveen A. (PI), Moerman KM.(Key person), *Early diagnosis and prevention of pressure related deep tissue injury.*

2010 **Award: €1000 Engineers Ireland Biomedical Research Medal** Engineers Ireland
Awarded at the 16th Bioengineering in Ireland Conference. Paper: *Towards the Non-Invasive Determination of the Mechanical Properties of Living Human Soft Tissue.*

2009 **Award: Bioengineering in Ireland Bronze Medal** Royal Academy of Medicine Ireland
1st best paper at the 15th Bioengineering in Ireland Conference, Paper: *A validation method for motion tracking techniques based on tagged MRI.*

2005 **Award: €1000 Bachelor Thesis Prize** The Royal Netherlands Society of Engineers, KIVI
3rd prize best Dutch bachelor thesis: *The Design and Development of Autonomic Solar Powered, Mobile Concentrate Feeding Robot for the Australian Dairy Industry.*

Selected publications*

*full list available at end of CV or online through ImpactStory and ORCID profile.

- Moerman KM et al., **Development of a Patient-Specific Cerebral Vasculature Fluid-Structure-Interaction Model**, *Open Sci. Framew. PREPRINT*, 2021. **DOI**: 10.31224/osf.io/qaujs.
- Moerman KM et al., **Automated and Data-driven Computational Design of Patient-Specific Biomechanical Interfaces** *Open Sci. Framew. PREPRINT*, 2021. **DOI**: 10.31224/osf.io/g8h9n.
- Moerman KM et al., **Novel Hyperelastic Models for Large Volumetric Deformations** *Int. J. of Solids and Structures*, 2020. **DOI**: 10.1016/j.ijsolstr.2020.01.019. OPEN ACCESS LINK
- Moerman KM., **GIBBON: The Geometry and Image-Based Bioengineering add-On.** *Journal of Open Source Software*, 2018. **DOI**: 10.21105/joss.00506. OPEN ACCESS LINK
- Moerman KM et al., **On the importance of 3D, geometrically accurate, and subject-specific finite element analysis for evaluation of in-vivo soft tissue loads**, *Comp. Meth. Biomech. Biomed. Engin.*, 2017. **DOI**: 10.1080/10255842.2016.1250259. OPEN ACCESS LINK
- Moerman KM et al., **Control of tension-compression asymmetry in Ogden hyperelasticity with application to soft tissue modelling**, *J.Mech.Behav.Biomed.Mater.*, 2016. **DOI**: 10.1016/j.jmbbm.2015.11.027. OPEN ACCESS LINK

Editorial board experience

01/2020-Now Academic Editor — PLOS ONE
04/2017-Now Section Editor — The Journal of Open Hardware
06/2016-Now Engrχiv co-founder, steering committee member — EngrXiv: The Engineering Archive
02/2016-Now Co-founder, Associate Editor in Chief — The Journal of Open-Source Software

Conference session and workshop organization

07/2022 Organizer of special session and workshop — ESMC 2022
09/2021 Organizer of workshop — CMBBE 2021
06/2021 Organizer of workshop — VPH 2021
09/2019 Organizer of special session and workshop — CMBBE 2019
07/2018 Organizer of special session and workshop — WCB 2018
08/2017 Organizer, host — MozillaScience Working Open Workshop Boston
09/2016 Organizer, host — Open Source Tools for Computational Biomechanics, IEEE Boston
10/2014 Committee member, organizer of special session and workshop — CMBBE 2014
07/2014 Organizer/chair for special sessions — World Congress of Biomechanics 2014
04/2013 Organizer/chair special session — CMBBE 2013

Extra-curricular activities

2019 Science outreach — PubhD Galway
2018-Now Open Science MOOC content and website developer — Open Science MOOC
2017-Now Developer of the Open Access Clinic website — Open Access Clinic

Published works

This section lists all scientific outputs which includes articles, pre-prints, data, software, hardware, and patents. The list is also available online through my ORCID and ImpactStory profile, the latter providing open access links.

Preprints

[1] Kevin Mattheus Moerman, Praneeta Konduri, Behrooz Fereidoonnezhad, Henk Marquering, Aad van der Lugt, Giulia Luraghi, Sara Bridio, Francesco Migliavacca, Jose Felix Rodriguez Matas, and Patrick McGarry. *Development of a Patient-Specific Cerebral Vasculature Fluid-Structure-Interaction Model*. type: article. engrXiv, Mar. 30, 2021. DOI: 10.31224/osf.io/qaujs. URL: https://engrxiv.org/qaujs/ (visited on 05/24/2021).

[2] Kevin Moerman, Kevin Moerman, David Sengeh, and Hugh Herr. *Automated and Data-driven Computational Design of Patient-Specific Biomechanical Interfaces*. 2016. DOI: 10.17605/OSF.IO/G8H9N. URL: http://doi.org/10.17605/OSF.IO/G8H9N.

Journal articles

[1] Coulter FB, Levey RE, Robinson ST, Dolan EB, Deotti S, Monaghan M, Dockery P, Coulter BS, Burke LP, Lowery AJ, Beatty R, Paetzold R, Prendergast JJ, and O'Cearbhaill ED. "Additive Manufacturing of Multi-Scale Porous Soft Tissue Implants That Encourage Vascularization and Tissue Ingrowth." In: *Advanced healthcare materials* (July 2021). DOI: 10.1002/adhm.202100229.

[2] B. Fereidoonnezhad, K.M. Moerman, S. Johnson, R. McCarthy, and P.J. McGarry. "A new compressible hyperelastic model for the multi-axial deformation of blood clot occlusions in vessels". In: *Biomechanics and Modeling in Mechanobiology* (2021). DOI: 10.1007/s10237-021-01446-4.

[3] Luraghi G, Bridio S, Rodriguez Matas JF, Dubini G, Boodt N, Gijsen FJH, van der Lugt A, Fereidoonnezhad B, Moerman KM, McGarry P, Konduri PR, and INSIST investigators. "The first virtual patient-specific thrombectomy procedure." In: *Journal of biomechanics* (Sept. 2021). DOI: 10.1016/j.jbiomech.2021.110622.

[4] Concannon J, Moerman KM, Hynes N, Sultan S, and McGarry JP. "Influence of shape-memory stent grafts on local aortic compliance." In: *Biomechanics and modeling in mechanobiology* (Dec. 2021). DOI: 10.1007/s10237-021-01514-9.

[5] Nataliya Perevoshchikova, Kevin Moerman, Bardiya Akhbari, Randy Bindra, Jayishni N. Maharaj, David G. Lloyd, Maria Gomez Cerezo, Amelia Carr, Cedryck Vaquette, and David J. Saxby. "Finite element analysis of the performance of additively manufactured scaffolds for scapholunate ligament reconstruction". In: *PLOS ONE* (2021). DOI: 10.1371/journal.pone.0256528. URL: http://doi.org/10.1371/journal.pone.0256528.

[6] Georgakopoulou T, van der Wijk AE, Bakker ENTP, vanBavel E, and INSIST investigators. "Quantitative 3D analysis of tissue damage in a rat model of microembolization." In: *Journal of biomechanics* (Sept. 2021). DOI: 10.1016/j.jbiomech.2021.110723.

[7] Concannon J, Hynes N, McMullen M, Smyth E, Moerman K, McHugh PE, Sultan S, Karmonik C, and McGarry JP. "A Dual-VENC Four-Dimensional Flow MRI Framework for Analysis of Subject-Specific Heterogeneous Nonlinear Vessel Deformation." In: *Journal of biomechanical engineering* (Nov. 2020). DOI: 10.1115/1.4048649.

[8] Kevin M. Moerman, Behrooz Fereidoonnezhad, and J. Patrick McGarry. "Novel hyperelastic models for large volumetric deformations". In: *International Journal of Solids and Structures* 193-194 (June 2020), pp. 474–491. DOI: 10.1016/j.ijsolstr.2020.01.019. URL: https://doi.org/10.1016%2Fj.ijsolstr.2020.01.019.

[9] Ted J. Vaughan, Frank Kirrane, Kevin M. Moerman, Tara Cahill, Anthony O'Regan, and Derek T. O'Keeffe. "A Novel Dual Non-Invasive Ventilator Continuous Positive Airway Pressure Non-Aerosolization Circuit for Emergency Use in the COVID-19 Pandemic". In: *Journal of Open Hardware* 4.1 (2020). DOI: 10.5334/joh.23. URL: https://doi.org/10.5334%2Fjoh.23.

[10] J. Concannon, P. Dockery, A. Black, S. Sultan, N. Hynes, P. E. McHugh, K. M. Moerman, and J. P. McGarry. "Quantification of the regional bioarchitecture in the human aorta". In: *Journal of Anatomy* (Sept. 2019). DOI: 10.1111/joa.13076. URL: https://doi.org/10.1111%2Fjoa.13076.

[11] Bryan J. Ranger, Micha Feigin, Xiang Zhang, Kevin M. Moerman, Hugh Herr, and Brian W. Anthony. "3D ultrasound imaging of residual limbs with camera-based motion compensation". In: *IEEE Transactions on Neural Systems and Rehabilitation Engineering* (2019), pp. 1–1. DOI: 10.1109/tnsre.2019.2894159. URL: https://doi.org/10.1109%2Ftnsre.2019.2894159.

[12] Dana Solav, Kevin M. Moerman, Aaron M. Jaeger, and Hugh Herr. "A framework for measuring the time-varying shape and full-field deformation of residual limbs using 3D digital image correlation". In: *IEEE Transactions on Biomedical Engineering* (2019), pp. 1–1. DOI: 10.1109/tbme.2019.2895283. URL: https://doi.org/10.1109%2Ftbme.2019.2895283.

[13] C. E. Lavecchia, D. M. Espino, K. M. Moerman, K. M. Tse, D. Robinson, P. V. S. Lee, and D. E. T. Shepherd. "Lumbar model generator: a tool for the automated generation of a parametric scalable model of the lumbar spine". In: *Journal of The Royal Society Interface* 15.138 (Jan. 2018), p. 20170829. DOI: 10.1098/rsif.2017.0829. URL: https://doi.org/10.1098%2Frsif.2017.0829.

[14] Kevin Moerman. "GIBBON: The Geometry and Image-Based Bioengineering add-On". In: *The Journal of Open Source Software* (2018). DOI: 10.21105/joss.00506. URL: http://doi.org/10.21105/joss.00506.

[15] A.M. Smith, K.E. Niemeyer, D.S. Katz, L.A. Barba, G. Githinji, M. Gymrek, K.D. Huff, C.R. Madan, A.C. Mayes, K.M. Moerman, P. Prins, K. Ram, A. Rokem, T.K. Teal, R.V. Guimera, and J.T. Vanderplas. "Journal of Open Source Software (JOSS): Design and first-year review". In: *PeerJ Computer Science* 2018.2 (2018). DOI: 10.7717/peerj-cs.147.

[16] Dana Solav, Kevin M. Moerman, Aaron M. Jaeger, Katia Genovese, and Hugh M. Herr. "MultiDIC: An Open-Source Toolbox for Multi-View 3D Digital Image Correlation". In: *IEEE Access* 6 (2018), pp. 30520–30535. DOI: 10.1109/access.2018.2843725. URL: https://doi.org/10.1109%2Faccess.2018.2843725.

[17] Willeke A. Traa, Mark C. van Turnhout, Kevin M. Moerman, Jules L. Nelissen, Aart J. Nederveen, Gustav J. Strijkers, Dan L. Bader, and Cees W. J. Oomens. "MRI based 3D finite element modelling to investigate deep tissue injury". In: *Computer Methods in Biomechanics and Biomedical Engineering* (Nov. 2018), pp. 1–10. DOI: 10.1080/10255842.2018.1517868. URL: https://doi.org/10.1080%2F10255842.2018.1517868.

[18] B. Lin, K.M. Moerman, C.G. McMahan, K.A. Pasch, and H.M. Herr. "Low-Cost Methodology for Skin Strain Measurement of a Flexed Biological Limb". In: *IEEE Transactions on Biomedical Engineering* 64.12 (2017), pp. 2750–2759. DOI: 10.1109/tbme.2016.2626442.

[19] K.M. Moerman, M. van Vijven, L.R. Solis, E.E. van Haaften, A.C.Y. Loenen, V.K. Mushahwar, and C.W.J. Oomens. "On the importance of 3D, geometrically accurate, and subject-specific finite element analysis for evaluation of in-vivo soft tissue loads". In: *Computer Methods in Biomechanics and Biomedical Engineering* 20.5 (2017), pp. 483–491. DOI: 10.1080/10255842.2016.1250259.

[20] J.L. Nelissen, L. De Graaf, W.A. Traa, T.J.L. Schreurs, K.M. Moerman, A.J. Nederveen, R. Sinkus, C.W.J. Oomens, K. Nicolay, and G.J. Strijkers. "A MRI-compatible combined mechanical loading and mr elastography setup to study deformation-induced skeletal muscle damage in rats". In: *PLoS ONE* 12.1 (2017). DOI: 10.1371/journal.pone.0169864.

[21] K.M. Moerman, C.K. Simms, and T. Nagel. "Control of tension-compression asymmetry in Ogden hyperelasticity with application to soft tissue modelling". In: *Journal of the Mechanical Behavior of Biomedical Materials* 56 (2016), pp. 218–228. DOI: 10.1016/j.jmbbm.2015.11.027.

[22] T. Nagel, U.-J. Görke, K.M. Moerman, and O. Kolditz. "On advantages of the Kelvin mapping in finite element implementations of deformation processes". In: *Environmental Earth Sciences* 75.11 (2016). DOI: 10.1007/s12665-016-5429-4.

[23] D.M. Sengeh, K.M. Moerman, A. Petron, and H. Herr. "Multi-material 3-D viscoelastic model of a transtibial residuum from in-vivo indentation and MRI data". In: *Journal of the Mechanical Behavior of Biomedical Materials* 59 (2016), pp. 379–392. DOI: 10.1016/j.jmbbm.2016.02.020.

[24] Kevin Moerman and. "Open source publishing to boost your career". In: (2015). DOI: 10.15200/winn.144174.45345. URL: https://doi.org/10.15200%2Fwinn.144174.45345.

[25] G.M. Cooney, K.M. Moerman, M. Takaza, D.C. Winter, and C.K. Simms. "Uniaxial and biaxial mechanical properties of porcine linea alba". In: *Journal of the Mechanical Behavior of Biomedical Materials* 41 (2015), pp. 68–82. DOI: 10.1016/j.jmbbm.2014.09.026.

[26] J. Gindre, M. Takaza, K.M. Moerman, and C.K. Simms. "A structural model of passive skeletal muscle shows two reinforcement processes in resisting deformation". In: *Journal of the Mechanical Behavior of Biomedical Materials* 22 (2013), pp. 84–94. DOI: 10.1016/j.jmbbm.2013.02.007.

[27] K.M. Moerman, A.M.J. Sprengers, A.J. Nederveen, and C.K. Simms. "A novel MRI compatible soft tissue indentor and fibre Bragg grating force sensor". In: *Medical Engineering and Physics* 35.4 (2013), pp. 486–499. DOI: 10.1016/j.medengphy.2012.06.014.

[28] A.M.J. Sprengers, M.W.A. Caan, K.M. Moerman, A.J. Nederveen, R.M. Lamerichs, and J. Stoker. "A scale space based algorithm for automated segmentation of single shot tagged MRI of shearing deformation". In: *Magnetic Resonance Materials in Physics, Biology and Medicine* 26.2 (2013), pp. 229–238. DOI: 10.1007/s10334-012-0332-9.

[29] M. Takaza, K.M. Moerman, J. Gindre, G. Lyons, and C.K. Simms. "The anisotropic mechanical behaviour of passive skeletal muscle tissue subjected to large tensile strain". In: *Journal of the Mechanical Behavior of Biomedical Materials* 17 (2013), pp. 209–220. DOI: 10.1016/j.jmbbm.2012.09.001.

[30] M. Takaza, K.M. Moerman, and C.K. Simms. “Passive skeletal muscle response to impact loading: Experimental testing and inverse modelling”. In: *Journal of the Mechanical Behavior of Biomedical Materials* 27 (2013), pp. 214–225. DOI: 10.1016/j.jmbbm.2013.04.016.
[31] K.M. Moerman, A.M.J. Sprengers, C.K. Simms, R.M. Lamerichs, J. Stoker, and A.J. Nederveen. “Validation of continuously tagged MRI for the measurement of dynamic 3D skeletal muscle tissue deformation”. In: *Medical Physics* 39.4 (2012), pp. 1793–1810. DOI: 10.1118/1.3685579.
[32] K.M. Moerman, A.M.J. Sprengers, C.K. Simms, R.M. Lamerichs, J. Stoker, and A.J. Nederveen. “Validation of SPAMM tagged MRI based measurement of 3D soft tissue deformation”. In: *Medical Physics* 38.3 (2011), pp. 1248–1260. DOI: 10.1118/1.3533942.
[33] C. Lally, V. Flamini, C. Kerskens, K.M. Moerman, and C.K. Simms. “Imaging arterial fibres using diffusion tensor imaging-feasibility study and preliminary results”. In: *Eurasip Journal on Advances in Signal Processing* 2010 (2010). DOI: 10.1155/2010/904091.
[34] K.M. Moerman, C.M. Kerskens, C. Lally, V. Flamini, and C.K. Simms. “Evaluation of a validation method for MR imaging-based motion tracking using image simulation”. In: *Eurasip Journal on Advances in Signal Processing* 2010 (2010). DOI: 10.1155/2010/942131.
[35] K.M. Moerman, C.A. Holt, S.L. Evans, and C.K. Simms. “Digital image correlation and finite element modelling as a method to determine mechanical properties of human soft tissue in vivo”. In: *Journal of Biomechanics* 42.8 (2009), pp. 1150–1153. DOI: 10.1016/j.jbiomech.2009.02.016.

Software/hardware/data

[1] Ted Vaughan, Frank Kirrane, Kevin Mattheus Moerman, Tara Cahill, Anthony O’Regan, and Derek O’Keeffe. *3DNIV/3DNIV: Development of a Dual Non-Invasive Ventilator Continuous Positive Airway Pressure (CPAP) Circuit for Emergency Use in the COVID19 Pandemic using 3D Printed Components*. 2020. DOI: 10.5281/zenodo.3818305. URL: http://doi.org/10.5281/zenodo.3818305.
[2] Kevin Moerman, Kevin Moerman, Bryan Ranger, and Hugh Herr. *Socket Evaluation Questionnaire*. 2016. DOI: 10.5281/ZENODO.61310. URL: http://doi.org/10.5281/ZENODO.61310.
[3] Kevin Moerman and Kevin Mattheus Moerman. *GIBBON (Hylobates Lar)*. 2016. DOI: 10.5281/ZENODO.44404. URL: http://doi.org/10.5281/ZENODO.44404.
[4] Kevin Mattheus Moerman. *GIBBON (Hylobates Agilis)*. Oct. 2014. DOI: 10.5281/zenodo.12214. URL: http://zenodo.org/record/12214.

Patents

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