

BENEDIKT SAGL, PHD

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EDUCATION

Medical University of Vienna, Austria Venia Docendi Discipline: Biomedical Engineering Exposé Title: "Computer-aided biomechanics of the masticatory system"	2024
Medical University of Vienna, Austria Doctor of Philosophy <i>Academic Focus: Biomechanical Simulation, Medical Imaging</i> Thesis Title: "Novel in-silico approaches for the investigation of the human masticatory system"	2016-2020
University of Saskatchewan, Canada Master's degree program in Computer Science <i>Academic Focus: Biomechanical Simulation, Medical Image Processing</i> Thesis Title: „Biomechanical Modeling of the Masticatory Region“	2014 - 2016
Technical University of Vienna, Austria Master's degree program in Biomedical Engineering	2012 - 2014
University of Applied Science Technikum Vienna, Austria Bachelor's degree program in Biomedical Engineering <i>Academic Focus: Medical Image Processing, Computer Simulation</i> Thesis Title: „Development of a Workflow for Segmentation of the Cranial Region“	2009 - 2012

WORK EXPERIENCE

Medical University of Vienna Research Associate <i>Projects focused on computational biomechanics of the masticatory region</i>	since 2017
Ludwig-Boltzmann-Institute for experimental and clinical traumatology - Karl Donath Laboratory Research Assistant <i>Processing and analysis of medical image data for various research projects</i>	2019
University of Saskatchewan, Canada Visiting Researcher <i>Development of a FEM TMJ model</i> <i>Development of a new optimization method for forward-dynamics tracking simulations</i>	2017
University of Saskatchewan, Canada Research Assistant <i>Computer simulations of the masticatory region</i>	2014 - 2016

Medical University of Vienna**2012**

Intern

*Development of a simple implementation of the Feldkamp CBCT-reconstruction algorithm***A.E.R.S Dental Medicine Organisations****2011 - 2017**

Research Assistant

Projects in the area of image processing and computational biomechanics of the jaw region

RESEARCH INTERESTS

Computer Simulation, Artificial Intelligence, Biomechanics, Medical Imaging

SCIENTIFIC PRODUCTION

Publications – metrical overview (22/03/24):In total: **14** original articles, **8** first author, **7** corresponding authorCumulative impact factor: **62,579**Cumulative citations: **104**h-index: **6**

PUBLICATIONS

(corresponding author starred; IF at time of acceptance)

	Impact Factor (SCI):
In vivo prediction of temporomandibular joint disc thickness and position changes for different jaw positions. Sagl B* , Schmid-Schwab M, Piehslinger E, Kronnerwetter C, Kundi M, Trattng S, Stavness I. J Anat. 2019 May;234(5):718-727. doi: 10.1111/joa.12951.	2.638
Fast Forward-Dynamics Tracking Simulation: Application to Upper Limb and Shoulder Modeling. Sagl B* , Dickerson CR, Stavness I. IEEE Trans Biomed Eng. 2019 Feb;66(2):335-342. doi: 10.1109/TBME.2018.2838020	4.288
A Dynamic Jaw Model With a Finite-Element Temporomandibular Joint. Sagl B* , Schmid-Schwab M, Piehslinger E, Kundi M, Stavness I. Front Physiol. 2019 Sep 13;10:1156. doi: 10.3389/fphys.2019.01156	3.367
Characterizing Motor Control of Mastication With Soft Actor-Critic. Abdi AH, Sagl B , Srungarapu VP, Stavness I, Prisman E, Abolmaesumi P, Fels S. Front Hum Neurosci. 2020 May 26;14:188. doi: 10.3389/fnhum.2020.00188	2.673
Bone healing around titanium implants in a preclinical model of bile duct ligation-induced liver injury. Talebian R, Kamleitner C, Sagl B , Kuchler U, Dehpour AR, Gruber R. Clin Oral Implants Res. 2021 Aug;32(8):980-988. doi: 10.1111/clr.13792.	5.977
A Novel Quantitative Method for Tooth Grinding Surface Assessment Using 3D Scanning. Sagl B* , Besirevic-Bulic F, Schmid-Schwab M, Laky B, Janjić K, Piehslinger E, Rausch-Fan X. Diagnostics (Basel). 2021 Aug 16;11(8):1483. doi: 10.3390/diagnostics11081483.	3.706

- An in silico investigation of the effect of bolus properties on TMJ loading during mastication. **Sagl B***, Schmid-Schwap M, Piehslinger E, Rausch-Fan X, Stavness I. **J Mech Behav Biomed Mater.** 2021 Dec;124:104836. doi: 10.1016/j.jmbbm.2021. **3.902**
- Experimental validation of a micro-CT finite element model of a human cadaveric mandible rehabilitated with short-implant-supported partial dentures. **3.902**
Zupancic Cepic L, Frank M, Reisinger AG, **Sagl B**, Pahr DH, Zechner W, Schedle A. **J Mech Behav Biomed Mater.** 2022 Feb;126:105033. doi: 10.1016/j.jmbbm.2021.105033.
- Effect of facet inclination and location on TMJ loading during bruxism: An in-silico study. **10.479**
Sagl B*, Schmid-Schwap M, Piehslinger E, Kundi M, Stavness I. **J Adv Res.** 2021 Apr 29;35:25-32. doi: 10.1016/j.jare.2021.04.009.
- The effect of tooth cusp morphology and grinding direction on TMJ loading during bruxism. **4.755**
Sagl B, Schmid-Schwap M, Piehslinger E, Rausch-Fan X, Stavness I. **Front Physiol.** 2022 Sep 15;13:964930. doi: 10.3389/fphys.2022.964930.
- Wear Management of Colored Foils for the Assessment of Sleep Bruxism Patterns-A Prospective, Randomized Crossover Study. Besirevic-Bulic F, Schmid-Schwap M, Kundi M, **Sagl B**, Piehslinger E. **Diagnostics (Basel).** 2023 Jan 4;13(2):172. doi: 10.3390/diagnostics13020172 **3.992**
- Differential gene expression and protein-protein interaction networks of human periodontal ligament stromal cells under mechanical tension. Janjić K, Nemec M, Maaser JL, **Sagl B**, Jonke E, Andrukhov O. **Eur J Cell Biol.** 2023 Jun;102(2):151319. doi: 10.1016/j.ejcb.2023.151319. **6.6**
- Functional reconstruction of the masseter muscle by microvascular free gracilis muscle transfer: technique and outcome. Gaggl A, Bottini GB, **Sagl B**, Rasse M. **Int J Oral Maxillofac Surg.** 2023 Jun 30:S0901-5027(23)00139-X. doi: 10.1016/j.ijom.2023.06.004. **2.4**
- The effect of bolus properties on muscle activation patterns and TMJ loading during unilateral chewing. **Sagl B***, Schmid-Schwap M, Piehslinger E, Yao H., Rausch-Fan X, Stavness I. **J Mech Behav Biomed Mater.** 2024 Mar;151:106401. doi: 10.1016/j.jmbbm.2024.106401 **3.9**
- Transfer accuracy of 3D printed versus CAD/CAM milled surgical guides for temporary orthodontic implants: a preclinical micro CT study. Schwärzler A., Ludwig B., Chitan P., Lettner S., **Sagl B.***, Jonke E. **J Dent.** 2024 May 10:105060. doi: 10.1016/j.jdent.2024.105060. **4.4**
- To what extent can mastication functionality be restored following mandibular reconstruction surgery? A computer modeling approach. Aftabi H, **Sagl B**, Lloyd JE, Prisman E, Hodgson A, Fels S. **Comput Methods Programs Biomed.** 2024 Jun; doi: 10.1016/j.cmpb.2024.108174. **6.1**
- Computational modeling, calibration and validation of impact-specific cervical spine models: A novel approach using hybrid multibody and finite element models. Holzinger T., Cazzola D., **Sagl, B.*** **under review**
- Identifying TMJ Disorder Morphological Risk Factors via Explainable Deep Learning and Multiscale Biomechanical Modeling. Sun S., Xu P., Buchweitz N., Hill C.N., Ahmadi F., Wilson M.B., Mei A., She X., **Sagl B.**, Slate E.H., Lee J.S., Wu Y., Yao H. **accepted**

THIRD PARTY FUNDING

Medical-Scientific Fund of the Mayor of Vienna Funding amount: 15,000 €, Co-I, PI: Prof. Piehslinger	2017
National Institute of Health – NIH <i>TMJ SYMPHONY: Systems-integrated model and mechanisms of patient-centered holistic outcomes and network-supported training and therapy.</i> RFA-DE-23-014 TMD IMPACT planning grant; Role: Co-I/ Site Leader/ Center Co-Chair (PI: Prof. Hai Yao, Clemson University) Funding amount: 200 000\$ (10 300\$ MUV)	2023
Investigator Initiated Trial - LM Technology <i>Investigation of biomechanical effects of Eruption Guidance Appliance (EGA) on the jaw bones and temporomandibular joints</i> Funding amount: 30 000 € , Role: PI	2023
Investigator Initiated Trial - Amann Girschbacher <i>Clinical safety and performance of custom-made zirconia restorations made of Zolid Gen-X and Zolid Bion</i> Funding amount: 263 960 € , Role: PI	2023
Grant submissions currently pending:	
Austrian Science Fund – FWF <i>Personalized modeling of TMJ sexual dimorphism biomechanics</i> Stand-Alone Project. Role: PI	under review
Austrian Science Fund – FWF <i>Using machine learning to identify new MRI image markers for TMD</i> Stand-Alone Project. Role: PI	under review

AWARDS

Rudolf Slavicek Paper Award of the Austrian Society of Dentistry – Charter Vienna	2020
Poster Presentation Award – YSA Symposium 2019	2019
Student scholarship, Medical University of Vienna Funding amount: 1,000 €	2016
Best Technical Demonstration Award, OpenSim Advanced User Workshop, Stanford University	2015
Travel Grant, OpenSim Advanced User Workshop, Stanford University Funding amount: 3,000 USD	2015
Travel Grant, Summerschool on Biomedical Imaging, ETH Zürich Funding amount: 500 CHF	2013
Performance scholarship, Technikum Vienna Funding amount: 762.72 € each	2011 – 2012

INVITED TALKS

ESB Webinar Series- No.15 <i>ArtiSynth: A Platform for Combined MultiBody and Finite Element Simulation</i>	2023
AnthropologyCA: Anthropology meets Dentistry <i>Methods for the analysis of TMJ biomechanics and evaluation of occlusal forces</i>	2023
6th SfN Satellite symposium on Craniofacial Neuroscience <i>Biomechanical effect of grinding facet inclination and position</i>	2021
17th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering <i>Computational investigation of the effect of bolus stiffness on TMJ loading during chewing</i>	2021
FE ZURICH 2021 Workshop <i>Using a combined rigid-body FEM model to investigate human jaw function</i>	2021
CAMS Knee Workshop <i>Investigating meniscus forces using a combined multibody-FEM model</i>	2020
CAMS Knee Workshop <i>ArtiSynth Tutorial</i>	2020
Clinic of Masticatory Disorders, University of Zurich, Switzerland <i>Invited Talk on the topic of biomechanical Simulation of the masticatory region</i>	2018
Media and Graphic Interdisciplinary Centre, University of British Columbia, Canada <i>Invited Talk on the topic of TMJ imaging and biomechanics</i>	2018

PROFESSIONAL SERVICE

Reviewer for various international journals including the International Journal of Oral Science, Journal of Oral Rehabilitation and Journal of Biomechanics

Member of Scientific Committee for the European Society of Biomechanics Congress 2022 and 2023

CONFERENCE PROCEEDINGS

9th International TMJ Interdisciplinary Research Meeting Sagl B. , Sun S., Holzinger T., Chen P., Chai J., Rausch-Fan, X., Lee J., Yao H. <i>Towards the integration of nociception into computational TMJ modeling</i>	2024
9th International TMJ Interdisciplinary Research Meeting Holzinger T., Schmid-Schwap M., Rausch-Fan, X., Yao H., Sagl B. <i>Using a three-dimensional deep learning approach to generate synthetic CT and MRI images for better analysis of TMJ structures</i>	2024

- 9th International TMJ Interdisciplinary Research Meeting** 2024
Sun S., Hill C., Damon B., Zhao J., Almpani K., Jani P., Ahmadi F., Chen J., **Sagl B.**, Lee J.S., Yao, H.
Using a three-dimensional deep learning approach to generate synthetic CT and MRI images for better analysis of TMJ structures
- 2024 IADR/ AADOCR Meeting** 2024
Sun S., Ahmadi F., **Sagl B.**, Hill C., Wu Y., Yao H.
Modeling TMJ Nociceptive Signal Generation with Structural and Neurological Interaction
- AAOMS 105th Annual Meeting** 2023
Sun S., Ahmadi F., Hill C., Almpani K., Jani P., Damon B., **Sagl B.**, Wu Y., Lee J.S., Yao H.
Bite Force Control Capacity Differs Between Dentofacial Differences and Improves With Orthognathic Surgery
- 2023 AADOCR/CADR Annual Meeting** 2023
Sun S., Ahmadi F., Hill C., Almpani K., Jani P., Damon B., **Sagl B.**, Wu Y., Lee J.S., Yao H.
Evaluating Bite Force Control Capacity Before And After Orthognathic Surgery
- European Society of Biomechanics Congress 2022** 2022
Sagl B., Schmid-Schwab M., Piehslinger E., Rausch-Fan X., Stavness I.
Differences in TMJ Loading between Mediotrusive And Laterotrusive Tooth Grinding
- European Society of Biomechanics Congress 2022** 2022
Holzinger T., Martinek J., Cazzola D., **Sagl B.**
Simulating Head-First Impact in Sport: A Hybrid Multibody And Finite Element Head And Neck Model
- TMJ Bioengineering Conference 7** 2022
Sagl B., Schmid-Schwab M., Piehslinger E., Rausch-Fan X., Stavness I.
The effect of bolus stiffness on TMJ loading and muscle excitation during unilateral chewing
- XXVIII Congress of the International Society of Biomechanics** 2021
Sagl B., Smith C.R., Lloyd J.E., Stavness I.
A forward-dynamics tracking simulation using a combined rigid body - FEM model to predict knee meniscus loading
- Viesid Summerschool 2021** 2021
Sagl B., Schmid-Schwab M., Piehslinger E., Kundi M., Stavness I.
Effect of facet inclination and location on TMJ loading during bruxism: An in-silico study
- International Association for Dental Research Genereal Session 2020** 2020
Sagl B., Hager B., Eder J., Schmid-Schwab M., Dworan J., Traxler H., Piehslinger E, Trattng S.
Examining TMJ Morphology using 7T-MR Microscopy: A Preliminary Investigation
- 52. Jahrestagung der Gesellschaft für Funktionsdiagnostik und -therapie** 2019
Sagl B., Schmid-Schwab M., Piehslinger E., Kundi M., Trattng S., Stavness I.
Ein detailliertes Computermodele der Kauregion basierend auf hochaufgelösten MRT Bilddaten

- XXVII Congress of the International Society of Biomechanics** **2019**
Sagl B., Schmid-Schwap M., Piehslinger E., Kundi M., Stavness I.
A Dynamic Jaw Model with a Finite-Element Temporomandibular Joint
- XVII International Symposium on Computer Simulation in Biomechanics** **2019**
Sagl B., Smith C, Schmid-Schwap M., Piehslinger E., Kundi M., Lloyd J., Stavness I.
A Novel Contact Model for the Computational Investigation of Synovial Joints with a Cartilaginous Disc
- European Society of Biomechanics Conference 2019** **2019**
Sagl B., Schmid-Schwap M., Piehslinger E., Kundi M., Stavness I.
A forward-dynamics tracking approach for the investigation of tooth grinding using a combined rigid body - FEM model
- 15th YSA PhD Symposium** **2019**
Sagl B., Schmid-Schwap M., Piehslinger E., Kundi M., Stavness I.
A Dynamic Jaw Model with a Finite-Element Temporomandibular Joint
- MIC Festival 2019 - Digital Revolution in Medical Imaging** **2019**
Sagl B., Schmid-Schwap M., Piehslinger E., Kundi M., Stavness I., Trattng S.
A detailed computer model of the masticatory region built from high-resolution MRI data
- Gesellschaft für Medizinische Ausbildung Jahrestagung** **2018**
Sagl B., Schmid-Schwap M., Piehslinger E., Kundi M., Stavness I.
Ein dreidimensionales, interaktives Computermodell der Kauregion und seine potentielle Anwendung in der medizinischen Lehre
- Viesid Summerschool 2018** **2018**
Sagl B., Schmid-Schwap M., Piehslinger E., Kundi M., Stavness I.
Development of a detailed Computational Model of the Masticatory Region
- TMJ Bioengineering Conference 6** **2018**
Sagl B., Schmid-Schwap M., Piehslinger E., Kundi M., Stavness I.
A Novel Combined Rigid Body – Finite Element Model for the Investigation of Temporomandibular Joint Loads
- 15th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering** **2018**
Sagl B., Schmid-Schwap M., Piehslinger E., Kundi M., Stavness I.
Towards Development of a Combined Rigid Body – Finite Element Model for the Investigation of Temporomandibular Joint Loads
- 40th Annual Meeting of the American Society of Biomechanics** **2016**
 Stavness, I., **Sagl, B.**, Cooper, J., Dickerson, C
Real-Time Forward-Dynamics Tracking Simulation with Joint Stability Constraints
- Viesid Summerschool 2015** **2015**
Sagl, B., Stavness, I., Slavicek, R.

Inverse Modeling of the Masticatory System

XXV Congress of the International Society of Biomechanics **2015**

Sagl, B., Stavness, I., Slavicek, R.

Forward-Dynamics Tracking with Reaction Force Targets

IAAID International Congress on Bruxism **2015**

Sagl, B., Stavness, I., Slavicek, R.

Biomechanical Simulation of Bruxism using Movement and Force Targets

Viesid Summerschool 2013 **2013**

Sagl, B., Slavicek, R.

Finite Element Analysis of Human Dentition

TEACHING ACTIVITIES

SE "SSM 2 - Three-dimensional studies of relevant variations **SS 2023**

in dental arch morphology"

Medical University of Vienna

SE "SSM 1 - Computational biomechanics of the musculoskeletal system" **since WS 2021**

Medical University of Vienna

VO "Biomechanics of the craniomandibular system" - **since SS 2021**

M Z-7 Removable prosthodontics

Medical University of Vienna

Lecture on biomechanics of the masticatory system with focus on TMJ

JC "Jawbone regeneration and oral tissue engineering", 850.033 **since SS 2019**

Medical University of Vienna

Preparing and chairing of a part of the journal club in the Doctoral Programme of Applied Medical Science

„Senior Mentoring, 800.000“ **since WS 2019**

Medical University of Vienna

Organisation of a mentoring environment for a group of medical students, discussion of relevant topics and support with study related problems

Supervision of Master and Diploma Thesis at the **since 2019**

Medical University of Vienna and the FH Technikum Vienna

Mentoring/ Co-Supervision of PhD students at the **since 2023**

Medical University of Vienna and Clemson University