BENEDIKT SAGL, PHD

Date of Birth: 04.03.1990
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EDUCATION

Medical University of Vienna, Austria **2024**
Habilitation/ Venia Docendi
Discipline: Biomedical Engineering
Exposé Title: ”Computer-aided biomechanics of the masticatory system”

Medical University of Vienna, Austria **2016-2020**
Doctor of Philosophy
Academic Focus: Biomechanical Simulation, Medical Imaging
Thesis Title: “Novel in-silico approaches for the investigation of the human masticatory system”

University of Saskatchewan, Canada **2014 - 2016**
Master’s degree program in Computer Science
Academic Focus: Biomechanical Simulation, Medical Image Processing
Thesis Title: „Biomechanical Modeling of the Masticatory Region”

University of Applied Science Technikum Vienna, Austria **2009 - 2012**
Bachelor’s degree program in Biomedical Engineering
Academic Focus: Medical Image Processing, Computer Simulation
Thesis Title: „Development of a Workflow for Segmentation of the Cranial Region”

WORK EXPERIENCE

Medical University of Vienna **since 2024**
University Clinic of Dentistry
Group Leader - Competence Center Artificial Intelligence in Dentistry
Leading projects on computational biomechanics and artificial intelligence in dentistry

Medical University of Vienna **since 2025**
Comprehensive Center AI in Medicine
Executive Board Member
Strategic development and coordination of collaboration within MUV

Clemson University **since 2024**
Department of Bioengineering
Adjunct Professor
Contributing to projects in computational biomechanics and artificial intelligence in bioengineering

Medical University of Vienna **2017 - 2024**
PhD Student and Postdoctoral Researcher
Projects focused on computational biomechanics of the masticatory region

Ludwig-Boltzmann-Institute for experimental and clinical traumatology - Karl Donath Laboratory **2019**
Research Assistant
Processing and analysis of medical image data for various research projects

University of Saskatchewan, Canada **2017**
Visiting Researcher
Development of a FEM TMJ model
Development of a new optimization method for forward-dynamics tracking simulations

University of Saskatchewan, Canada **2014 - 2016**
Research Assistant
Computer simulations of the masticatory region

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

Artificial Intelligence, Computer Simulation, Biomechanics, Medical Imaging

SCIENTIFIC PRODUCTION

Publications – metrical overview (05/06/25):
In total: **20** original articles, **8** first author, **11** corresponding author, **2** senior author
Cumulative impact factor: **90.897**
Cumulative citations: **177**
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-Schwap M, Piehslinger E, Kronnerwetter C, Kundi M, Trattnig 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-Schwap 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. **2.673**
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

Bone healing around titanium implants in a preclinical model of bile duct ligation-induced liver injury. Talebian R, Kampleitner 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-Schwap 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. **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. **4.755**

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. **6.1**

Comput Methods Programs Biomed. 2024 Jun; doi: 10.1016/j.cmpb.2024.108174.

Explainable deep learning and biomechanical modeling for TMJ disorder morphological risk factors. Sun S, Xu P, Buchweitz N, Hill CN, Ahmadi F, Wilson MB, Mei A, She X, **Sagl B**, Slate EH, Lee JS, Wu Y, Yao H. **JCI Insight**. 2024 Jul 11;9(16):e178578. doi: 10.1172/jci.insight.178578. **6.3**

A Dietary Supplement in the Management of Patients with Lumbar Osteochondrosis: A Randomized, Double-Blinded, Placebo-Controlled Study. Laky B, Huemer D, Eigenschink M, **Sagl B**, Thell R, Wagner KH, Anderl W, Heuberer PR. Nutrients. 2024 Aug 14;16(16):2695. doi: 10.3390/nu16162695. **4.8**

Development, calibration and validation of impact-specific cervical spine models: A novel approach using hybrid multibody and finite-element methods. Holzinger T., Cazzola D., **Sagl, B.* Comput Methods Programs Biomed.** 2024 Sep 18:257:108430. doi: 10.1016/j.cmpb.2024.108430 **4.9**

A comparative study of digital and conventional occlusal indicators: Accuracy and reliability of the T-Scan Novus, wax occlusogram, and articulating silk in clinical application. Reich K.M., Tatzber V., Skolka A., Piehslinger E., Lettner S., Kundi M, **Sagl B.* J Dent**. 2025 Mar 15:105695. 10:105060. doi: 10.1016/j.jdent.2025.105695 **4.8**

Virtual planned orthodontic implants transferred by CAD/CAM milled surgical guides are superior to freehand: A preclinical micro CT study. Schwärzler A., Chitan P., Panwinkler S., Domic D., **Sagl B.***, Jonke E. **under review**

SCIENTIFIC FUNDING

Total acquired funding: **650 145,08 €**
Number of projects as PI: **3**
Number of Projects as Co-I: **2**
Funding sources: **FFG, NIH, Industry**
Currently requested funding: 1 276 893,74 €

THIRD PARTY FUNDING

Medical-Scientific Fund of the Mayor of Vienna **2017**
Funding amount: 15,000 €, Co-I, PI: Prof. Piehslinger

National Institute of Health – NIH **2023**
TMJ SYMPHONY: Systems-integrated model and mechanisms of patient-centered holistic outcomes and network-supported training and therapy.
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)*

Investigator Initiated Trial - LM Technology **2023**
Investigation of biomechanical effects of Eruption Guidance Appliance (EGA) on the jaw bones and temporomandibular joints
Funding amount: **30 000 €**, Role: PI

Investigator Initiated Trial - Amann Girrbach **2024**
Clinical safety and performance of custom-made zirconia restorations made of Zolid Gen-X and Zolid Bion
Funding amount: **263 960 €**, Role: PI

Austrian Research Promotion Agency – FFG **2025**
TMD TRACE - Training of neural networks and Research for Advanced Classification and Explanation of mandibular kinematics
BRIDGE 2024-02 Project.
Funding amount: ***355 712,00 €****,* Role: PI

Grant submissions currently pending:

Austrian Science Fund – FWF **under review**
Personalized modeling of TMJ sexual dimorphism biomechanics
Stand-Alone Project. Role: PI
Requested funding: 448 904.10 €

National Institute of Health – NIH **under review**
TMJ SYMPHONY: Systems-integrated model and mechanisms of patient-centered holistic outcomes and network-supported training and therapy.
RFA-DE-25-003
Role: Co-Director Bioinformatics Core, Site Pi
Requested funding: 26 430 596$ (MUV: 448 251$)

Austrian Science Fund – FWF **in resubmission**
Using machine learning to identify new MRI image markers for TMD
PI Project. Role: PI
Requested funding: 433 719.51 €

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 **2016**
Funding amount: 1 000 €

Best Technical Demonstration Award, OpenSim Advanced User Workshop, Stanford University **2015**

Travel Grant, OpenSim Advanced User Workshop, Stanford University **2015**
Funding amount: 3 000 USD

Travel Grant, Summerschool on Biomedical Imaging, ETH Zürich **2013**
Funding amount: 500 CHF

Performance scholarship, Technikum Vienna **2011 – 2012**
Funding amount: *762.72 € each*

INVITED TALKS

Texas A&M University: Pathways to Excellence **2025**
Data-Driven Discovery in Dentistry: Integrating AI and simulation to understand and treat orofacial disorders

Austrian Society for Oral and Maxillofacial Medicine **2025**
Artificial intelligence (AI) in dentistry - future or reality?

19th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering **2024**
Combining finite element and mulitbody modeling to simulate joint stress during dynamic tasks

ESB Webinar Series- No.15 **2023**
ArtiSynth: A Platform for Combined MultiBody and Finite Element Simulation

AnthropologyCA: Anthropology meets Dentistry **2023**
Methods for the analysis of TMJ biomechanics and evaluation of occlusal forces

6th SfN Satellite symposium on Craniofacial Neuroscience **2021**
Biomechanical effect of grinding facet inclination and position

17th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering **2021**
Computational investigation of the effect of bolus stiffness on TMJ loading during chewing

FE ZURICH 2021 Workshop **2021**
Using a combined rigid-body FEM model to investigate human jaw function

CAMS Knee Workshop **2020**
Investigating meniscus forces using a combined multibody-FEM model

CAMS Knee Workshop **2020**
ArtiSynth Tutorial

Clinic of Masticatory Disorders, University of Zurich, Switzerland **2018**
Invited Talk on the topic of biomechanical Simulation of the masticatory region

Media and Graphic Interdisciplinary Centre, University of British Columbia, Canada **2018**
Invited Talk on the topic of TMJ imaging and biomechanics

PROFESSIONAL SERVICE

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

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

CONFERENCE PROCEEDINGS

10th International TMJ Interdisciplinary Research Meeting **2025**
Holzinger T., Schmid-Schwap M., Rausch-Fan, X., Yao. H, **Sagl B.**
Enhancing TMJ MRI Classification: A 3D Multiclass Deep Learning Framework with Contrastive Learning

19th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering **2024**
Aftab H., **Sagl B**., Lloyd J. E., Prisman E., Hodgson A., Fels S.
Predicting TMJ disc response to jaw reconstruction surgery: a computer modeling approach

19th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering **2024**
Herbst E. C., Lloyd J. E., **Sagl B.**, Ferguson S. J, Moroder P.
Towards patient specific fem shoulder modeling

9th International TMJ Interdisciplinary Research Meeting **2024**
Sagl B., Sun S., Holzinger T., Chen P., Chai J., Rausch-Fan, X., Lee J., Yao H.
Towards the integration of nociception into computational TMJ modeling

9th International TMJ Interdisciplinary Research Meeting **2024**
Holzinger T., Schmid-Schwap M., Rausch-Fan, X., Yao H., **Sagl B.**
Using a three-dimensional deep learning approach to generate synthetic CT and MRI images for better analysis of TMJ structures

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-Schwap 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-Schwap 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-Schwap 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-Schwap M., Dworan J., Traxler H., Piehslinger E, Trattnig S.
Examining TMJ Morphology using 7T-MR Microscopy: A Preliminary Investigation

52. Jahrestagung der Gesellschaft für Funktionsdiagnostik und -therapie **2019**
Sagl B., Schmid-Schwap M., Piehslinger E., Kundi M., Trattnig S., Stavness I.
Ein detailliertes Computermodel 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
Sagl B., Schmid-Schwap M., Piehslinger E., Kundi M., Stavness I., Trattnig S. **2019**
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 Computermodel 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

VB "Digital Dentistry" **WS 2024**
Medical University of Vienna

JC "Orthopaedics and Trauma Surgery" **since WS 2024**
Medical University of Vienna
Preparing and chairing of a part of the journal club in the Doctoral Programme of Applied Medical Science

SE "SSM 2 - Three-dimensional studies of relevant variations in dental arch morphology" **SS 2023**
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" - M Z-7 Removable prosthodontics **since SS 2021**
Medical University of Vienna
Lecture on biomechanics of the masticatory system with focus on TMJ

JC "Jawbone regeneration and oral tissue engineering", 850.033 **SS 2019 – SS 2024**
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 Medical University of Vienna and the FH Technikum Vienna **since 2019**

Supervision of PhD students at the Medical University of Vienna and Clemson University **since 2023**