



Graz Study on Health & Aging (GSHA)

An excellent cohort from BBMRI.at partner Medical University of Graz



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The Graz Study on Health & Aging (GSHA) was initiated in 2010 as a multidisciplinary concerted research effort of the Med Uni Graz, Uni Graz, the City of Graz and and the Styrian County Hospitals. The focus of the study is on human aging, one of the major challenges for medical sciences and health policy in the next decades. The pilot phase was running 2016-17.

Hypotheses

- Human aging is a synchronized manifestation of functional and morphological changes involving all organ systems and in its complexity can only be assessed by a multidisciplinary approach.
- Inter-individual differences in onset and pace of aging are explained by inherited, lifestyle, environmental and social factors
- Identification of common “aging” pathways affecting several or all organ systems allows the identification of potential high-impact targets to prevent age-related disability.

Study design

The GSHA is a community-based cohort study. Suitable persons were randomly selected from the official population register of the city of Graz and invited to participate in the study by sending an invitation card. The response rate was approx. 25%.

Data collection

- The GSHA includes surveys using questionnaires collecting information on socio-demographic data, medication, family history and medical history; life style such as nutrition, physical activity, social behavior; quality of life; reproduction; sleeping habits and personality.

- Clinical correlates of the aging process are assessed by thorough physical examinations of the nervous system, brain, eyes, skin, and cardiovascular system and imaging techniques of the heart, brain and eyes.
- Blood, DNA, RNA, urine and saliva samples of the participants are collected and archived for future use in the Biobank of Graz. Routine laboratory parameters, as also for the hormone status, the composition of the immune system, and genetic parameters such as the length of the telomeres will be measured at the time point of the recruitment.

Profile of the cohort:

Research Area	Genetic epidemiology of human aging
Cohort Type	Human, observational, cross-sectional
Cohort Size	Number of participants: 100 Number of visits: 1 (baseline)
Donor Details	Inclusion criteria: • Permanent residency of the city of Graz • Age ≥ 45ys • Men/women • Sufficient knowledge of German (for self-assessment) in order to fill out questionnaires and perform cognitive tests Exclusion criteria: • Cancer and/or chemotherapy currently or in the last 2ys • Pregnancy • Refusing to donate blood sample
Biological Sample Types (with Storage Condition)	• EDTA/citrate/heparin plasma (-80°C) • Serum (-80°C) • Stool (-80°C) • Urine (-80°C) • Skin swab (-80°C) • DNA • RNA
Associated Data	Medical history Risk factors Medication Clinical exam Anthropometry Cardiology • Anamnesis • Cardiologic examination • EKG • 24-h blood pressure monitoring • Echocardiography • Ergometry Neurology • Anamnesis, Stroke, Dementia • Neurological Examination • Cognitive Tests (MMSE, CERAD, NYUPRT) • Movement ability

- MDS-UPDRS (Parkinson scale)
- BFM-Scale
- Tetras-Scale
- IRLS
- NMS
- UPSIT
- Fullerton Balance scale
- Urogenital Distress Inventory-6 (UDI-6)
- Incontinence Impact Questionnaire (IIQ-7)

Neuroimaging

- Structural 3 T MRI
- DTI, MTI
- iron mapping
- Duplex scanning of carotid artery
- Transcranial Doppler Sonography (TCD)
- Midbrain Sonography
- Functional connectivity

Dermatology

- Fitzpatrick-Typing of skin
- Sun exposition, Sun burn, Sun screen
- Anamnese (polymorphic light eruption)
- Clinical examination
- Eyes and hair colorimetry
- Skin pH (SSC3)
- Lipid/water composition
- Skin elasticity (non-invasive elastometry)
- Hair and scalp status, axillary hair, hair quality and quantity
- Skin surface structure (Microphotography)
- Inner skin structure (in vivo confocale microscopy)
- Nevi (surface microscopy)
- Precancerous skin lesions (total body photography)

Ophtalmology

- Anamnesis
- Clinical eye examination
- Optic disc (HRT3)
- Axial length (IOL Master)
- Refractive status (Accuref-K 9001)
- Visus, Intraocular pressure
- Cornea thickness (Pachmate)
- Fundus
- Retina thickness (Cirrus HD-OCT)
- Retina circulation (RVA)
- Photography

Laboratory

- Hematology: Kl. BB & Diff. BB, mech,
- Serum routine Electrolyte, Kidney; Liver; Glucose, HbA1c IFCC, Thrombotic factors (APTT, Fibrinogen); CRP; Folic acid; Cholesterin, Trigliceride HDL-Chol, VLDL-Chol., LDL-Chol; Total protein; Ferritin, sTrfR; IgG, IgA, IgM; Serum Elfo
- NO-Stress, Oxidative Stress,

	• Vitamin status • Hormon status, • Blood coagulation • Iron metabolism • Leptin, Adiponectin, Adipocin, Resistin • Urin: test strips; sediments, Ca²⁺, Ca²⁺/Creatinin, Phosphate, Creatinin, Albumin Socio-economic factors/personality • WHO-Quality of Life 100 • Geriatric depression scale • NEO Five Factor Inventory • Sense of Coherence 13 • Self efficacy • Social support scale • Social readjustment rating scale • Consume behaviour • Art/creativity Lifestyle • smoking: passive/active • alcohol consumption • nutrition: FFQ, Food preference, Logbook • physical activity (actigram, logbook, ergometer) Gripstrength, Static/dynamic balance: MTF platform, Walking speed Personality Chronotype Menopause distress Genetics • Family history • Whole genome sequence • MethylC-Capture-Sequencing
Collection Period	2016-17 Pilot Study
Informed Consent	• Study specific consents (general & clinic specific) • Biobank consent
Access	Collaboration only
Quality Standards	ISO 9001:2015 ISO 15189
Contact	Principle investigator: Helena Schmidt, MD PhD Professor for Genetic Epidemiology & Susceptibility Diagnostics Head of Research Unit Genetic Epidemiology Gottfried Schatz Research Center for Cellular Signaling Metabolism and Aging Institute for Molecular Biology and Biochemistry https://www.medunigraz.at/team-helena-schmidt Tel: +43/316/385-71944 Fax: +43/316/385-79615

Publications (scientific)	See below
Media articles	See below



Publication list:

- Gampawar P, Saba Y, Werner U, Schmidt R, Müller-Myhsok B, Schmidt H. **Evaluation of the Performance of AmpliSeq and SureSelect Exome Sequencing Libraries for Ion Proton.** Front Genet. 2019 Sep 25;10:856. doi: [10.3389/fgene.2019.00856](https://doi.org/10.3389/fgene.2019.00856). PMID: [31608108](https://pubmed.ncbi.nlm.nih.gov/31608108/); PMCID: [PMC6774276](https://pubmed.ncbi.nlm.nih.gov/PMC6774276/).
- Mishra A, Chauhan G, Violleau MH, Vojinovic D, Jian X, Bis JC, Li S, Saba Y, Grenier-Boley B, Yang Q, Bartz TM, Hofer E, Soumaré A, Peng F, Duperron MG, Foglio M, Mosley TH, Schmidt R, Psaty BM, Launer LJ, Boerwinkle E, Zhu Y, Mazoyer B, Lathrop M, Bellenguez C, Van Duijn CM, Ikram MA, Schmidt H, Longstreth WT, Fornage M, Seshadri S, Joutel A, Tzourio C, Debette S. **Association of variants in HTRA1 and NOTCH3 with MRI-defined extremes of cerebral small vessel disease in older subjects.** Brain. 2019 Apr 1;142(4):1009-1023. doi: [10.1093/brain/awz024](https://doi.org/10.1093/brain/awz024). PMID: [30859180](https://pubmed.ncbi.nlm.nih.gov/30859180/); PMCID: [PMC6439324](https://pubmed.ncbi.nlm.nih.gov/PMC6439324/).
- Gampawar P, Schmidt R, Schmidt H. **Leukocyte Telomere Length Is Related to Brain Parenchymal Fraction and Attention/Speed in the Elderly: Results of the Austrian Stroke Prevention Study.** Front Psychiatry. 2020 Feb 28;11:100. doi: [10.3389/fpsyt.2020.00100](https://doi.org/10.3389/fpsyt.2020.00100). PMID: [32180739](https://pubmed.ncbi.nlm.nih.gov/32180739/); PMCID: [PMC7059269](https://pubmed.ncbi.nlm.nih.gov/PMC7059269/).

Media articles:

- DerStandard online vom 26.02.2014: [Dem Schlüssel zur ewigen Jugend auf der Spur](#)
- Kleine Zeitung vom 27.02.2014: *Wie wird man gesund alt?*
- LISA online vom 27.02.2014 Grazer Altersforschung: *Durch Prävention zur ewigen Jugend*
- der Grazer vom 02.03.2014: *Grazer Forscher: dem Altern auf der Spur*
- orf.at vom 04.03.2014 zum Nachlesen: [Studie: Meduni erforscht das Altern](#)
- Kleine Zeitung online vom 04.03.2014: *"Graz Study" nimmt Alterungsprozesse unter die Lupe*
- Salzburger Nachrichten online vom 04.03.2014: ["Graz Study" nimmt Alterungsprozesse unter die Lupe](#)
- Kronen Zeitung online vom 04.03.2014: ["Graz Study" - Forscher nehmen Alterungsprozesse unter die Lupe](#)
- APA-Science vom 04.03.2014: *"Graz Study" nimmt Alterungsprozesse unter die Lupe*
- Tagblatt Wiener Zeitung online vom 04.03.2014: ["Graz Study" nimmt Alterungsprozesse unter die Lupe](#)

- Kurier vom 05.03.2014: *Medizin-Uni untersucht das Altern mit Studie*
- Tiroler Tageszeitung online vom 19.04.2014: [Ewig jung: „Graz Study“ nimmt Alterungsprozesse unter die Lupe](#)
- TV Auftritt vom 26.01.2016 zum Nachlesen: [Körperliche Fitness hält das Gehirn jung](#)
- TV Auftritt vom 27.01.2016 zum Nachlesen: [Fitness hält auch das Gehirn gesund](#)