ACT Project catalogue

Revised December 2021

	Core group	ACT-affiliated researchers	Collaborators	PhD student
1	*Objective and subjective masticatory ability*	Inger Wårdh, Mats Trulsson	Ann-Marie Boström, Gerd Faxén Irving, Angelika Lantto, Robert Lundqvist	Per Stjernfedt
2	*Frailest/osteoporosis*	Pia Skott, Åke Seiger	Helena Salminen, Sven Nyrén, Holger Theobald, Grethe Jonasson	Charlotta Elleby
3	*Chew and think*	Mats Trulsson, Pia Skott, Gunilla Sandborgh Englund,	Erik Westman, Urban Ekman, Åke Seiger, J-I Smedberg	Linn Hedberg
4	*Domiciliary dental care*	Inger Wårdh, Pia Skott	Petteri Sjögren, Georgios Belibasakis, Niels Ganzer, Kristina Edman, Helena Domeij	Elisabet Morén
5	*Oral screen training post stroke*	Gunilla Sandborgh Englund, Pia Skott, Åke Seiger	Anita McAllister, Elisabet Åkesson, Jesper Dalum, Emmelie Persson, Åsa Karlsson, Åke Seiger	
6	*Chew and swallow/MoWo*	Mats Trulsson, Gunilla Sandborgh Englund, Pia Skott	Abhishek Kumar, Anastasios Grigoriadis, Tommy Cederholm et al	
7	*Hyperparathyroidism and oral health*	Gunilla Sandborgh Englund	Inga-Lena Nilsson, Kåre Buhlin, Fredrik Granath, Duangjai Lexomboon	
8	*Assessment of masticatory function in people with dental implants*	Mats Trulsson	Anastasios Grigoriadis, Abhishek Kumar	George Homsi

Principal Investigator:
Inger Wårdh

PhD student
Per Stjernfeldt

Co-investigators:
Ann-Marie Boström
Mats Trulsson
Gerd Faxén Irving
Angelika Lantto
Robert Lundkvist
Helena Domeij

2022-01-18

Title

1.   **Objective and subjective masticatory ability in older individuals**

Project overview

Project start	**2014**	
Calculated end	2022-2023	
Grants awarded	KI-stiftelser 2015	
Source	ACT FTV Stockholm	
Year	2016-2021	

Aim

The aim of this project is to understand which factors affect an older individual's objective and subjective masticatory ability and how they can be measured. As a secondary aim, the project may reveal knowledge about which treatments should be prioritized to preserve or enhance masticatory ability.

Project description

The importance of masticatory ability increases with increasing age. It is not only of importance for food intake and nutritional status, but also cognitive function. A correlation between cognitive function and masticatory ability has recently been shown in humans and animals. However, understanding which factors affect an older individual's masticatory function is a complicated process. Aspects other than occlusal contacts, occluding pairs or supporting zones may have more significant importance than previously expected. Therefore, it is important to address such

factors to identify the type of oral rehabilitation for implementation in older patients. A significant number of older patients in Sweden, in need of dental care, are eligible for financial support through the county council. This support covers "necessary dental care" allowing both the counties and the dentists to make an informed decision on relevant therapy. In that decision process masticatory ability is an important aspect as one of the intentions with the support is improved nutrition. The aim of this project is to understand which factors that affect an older individual's objective and subjective masticatory ability and how they can be measured.

The following issues are addressed:
1. A systematic literature review: To identify valid and reliable instruments for assessing objective masticatory ability.
2. A qualitative interview study: To explore older individuals' experience of their masticatory ability and factors related to this ability.
3. A clinical study: To examine relationships between objective and subjective assessments on masticatory ability and oral status including prosthetic therapy.
4. A qualitative interview study: To explore dentists, general and specialists, views and measurements of masticatory ability in older individuals.

Project status December 2021

Part 1: Finished
Part 2: Finished
Part 3 Manuscript ready to submit
Part 4 Ongoing

Publications

Elgestad Stjernfeldt P, Wårdh I, Trulsson M, Faxén Irving G, Boström AM. Methods for objectively assessing clinical masticatory performance: protocol for a systematic review. Syst Rev. 2017 Jan 26;6(1):20. doi: 10.1186/s13643-016-0403-5.

Elgestad Stjernfeldt P, Sjögren P, Wårdh I, Boström AM. Systematic review of measurement properties of methods for objectively assessing masticatory performance. Clin Exp Dent Res. 2019 Jan 31;5(1):76-104. doi: 10.1002/cre2.154.

Elgestad Stjernfeldt P, Faxén-Irving G, Wårdh I. Masticatory ability in older individuals: A qualitative interview study. Gerodontology. 2021 Jun;38(2):199-208. doi: 10.1111/ger.12515.

Principal Investgator:
Helena Salminen
(Supervisor)

Co-investigators:
Charlotta Elleby
(PhD student)

Pia Skott
Sven Nyrén
Holger Theobald
(Co-Supervisors)

Grethe Jonasson
(Research collaborator)

2022-01-18

Title

2. New ways of identifying individuals at risk for frailty and fragility fractures

Project overview

Project start	**2016**	
Calculated end	2023	
Grants awarded		
Source	ACT FTV Stockholm	
Year	2016-2019	

Aim

The aim of this study is to find and compare methods to identify individuals with augmented risk of frailty and fragility fractures by assessing the trabecular bone structure in dental radiographs combined with other risk factors

Project description

The purpose of the study is to investigate if risk for future fractures can be determined by assessing the trabecular bone structure in dental intra oral radiographs and if the identified individuals exhibit additional risk factors for developing hidden illness and frailty. The Rebus cohort gives possibilities to study the predictive value of risk factors associated with fragility fractures during a follow-up of up to 45 years. Identifying the high risk patients enables early inset of effective preventive treatments such as medication and physical activity, which would decrease both the suffering of individuals and high costs for the society. Dental radiographs are taken regularly on individual indication on a large part of the population and the dentists are familiar in analyzing them. The use of bone structure

analysis as a tool to determine risk of future fractures and frailty would put additional value to the regular dental appointment.

Studies included:

Study I: Aim: To study two methods of assessment of intra oral radiographs and their association to fragility fractures during a follow up time of up to 47 years using data of 837 individuals in the Rebus dental cohort.

Study II: Aim: To study the predictive value of certain risk factors for elevated fracture risk during a follow-up period of up to 47 years. Using data of the 30 000 individuals that participated in the original Rebus cohort

Study III: Aim: To study the correlation of different medical diagnoses to fragility fractures in a longitudinal cohort with a follow-up of up to 47 years. Using data of the 30 000 ind from the original Rebus Cohort

Study IV: Aim: To study changes in trabecular structure of the mandibular bone on intra oral radiographs from examinations that took place in 1970, 1980 and/or 1990 in a longitudinal cohort with a follow-up of up to 47 years, and the association to medical diagnoses. This will be done on 900 subjects in the Rebus dental cohort.

Project status December 2021

The Rebus longitudinal dataset, including radiographs, was organized at the start of the study. Etihical approval was obtained from Regional Ethical Review Board in Stockholm for the four planned studies. The Ethical Review Board in Gothenburg has also approved of a pilot study, using data from two existing cohorts with DXA values for testing of the methods. Data from the Swedish national Patient Register and Cause of Death Register for all four studies has been acquired. All radiographs have been digitized and assessed using the two methods.

Study I: Published.

Study II: Remains: Statistical analysis and manuscript writing.

Study III: Remains: Statistical analysis and manuscript writing

Study IV: Remains: Statistical analysis and manuscript writing.

Publications

Elleby C, Skott P, Jonasson G, Theobald H, Nyrén S, Salminen H: Evaluation of the predicted value of two methods to identify individuals with high risk of fragility fractures using intraoral radiographs. Eur J Oral Sci 2021 Oct;129(5):e12801. doi: 10.1111/eos.12801.

Principal Investigator:
Urban Ekman
Mats Trulsson
(Supervisor)

Co-investigators:
Linn Hedberg
(PhD student)

Eric Westman
Åke Seiger
Pia Skott
Gunilla Sandborgh
Englund

2022-01-18

Title

3. **The COGCHEW project: The cognitive changes and neural correlate after rehabilitation of mastication in older people – an intervention study**

Project overview

Project start	**2016**	
Calculated end	2024	
Grants awarded	6*425 000	
Source	SOF	
Year	2017-2019, 2020-2022	

Aim

To evaluate the association between masticatory function in elderly and neurocognitive function. By conducting an intervention study in elderly people with impaired masticatory we aim to evaluate this association, and to establish a causal relationship

Project description

Tooth loss and reduction of masticatory function is a risk factor for dementia and cognitive decline. The question of whether this detrimental effect on cognitive function caused by tooth loss is reversible through oral rehabilitation is of particular importance. Although an association between masticatory impairments and neurocognitive functions seems evident, intervention studies on humans is lacking, and a causal relationship has not been established. We aim to conduct an intervention study on older people where rehabilitation of masticatory functions is

performed and evaluated with cognitive measures and brain imaging. Patients (n=80) between 70 and 79 years of age, who suffer from masticatory impairment (Eichner's index B3- B4 or C1-C4) are recruited at the Eastman clinic. Oral rehabilitation is performed as agreed between the dentist and the patient. Evaluation methods: Subjective and objective mastication ability, neuropsychological assessments (a range of cognitive domains with primary focus on memory and executive functions) and MRI are performed before and 3 months after oral rehabilitation. In a subgroup, retest effects are ascertained by repeated pretest, 3 month after first test. The cognitive tests will be analyzed as repeated measure ANOVAs with group (experimental and control) and Date (pre- and post-rehabilitation) as factors. Group by Date interaction, main effect of group, and main effect of Date analysis will be evaluated. Brain imaging: Pre-processing and statistical analyses of MRI data will be performed with Statistical Parametric Mapping (SPM) run in Matlab (MathWorks). Movement correction will be performed by realign and unwarp to the first image in the series. To consider groupspecific anatomical brain differences, all patients will be normalized to Montreal Neurological Institute (MNI) echoplanarimaging template. To investigate rehabilitating related changes repeated measure ANOVAs will be performed with group (experimental and control) and Date (pre- and postrehabilitation) as factors.

Project status December 2021

Enrolment of patients is ongoing. Baseline measurements have been recorded in 44 participants and MRI measurements have been conducted in 22 of these participants. A first paper presenting the protocol of the study is published (2021) and a second paper describing the baseline data is soon to be submitted.

Publications

Hedberg L, Ekman U, Engström Nordin L, Smedberg J-I, Skott P, Seiger Å, Sandborgh-Englund G, Westman E, Kumar A, Trulsson M. Cognitive changes and neural correlates after oral rehabilitation procedures in older adults - Protocol for a randomized controlled interventional study. BMC Oral Health 2021 Jun 9;21(1):297. doi: 10.1186/s12903-021-01654-5.

Principal Investigator:
Inger Wårdh

Co-investigators:

PhD student Elisabeth Morén

Georgios Belibasakis
Petteri Sjögren
Pia Skott
Kristina Edman,
Niels Ganzer
Helena Domeij

2022-01-18

Title

4. Domiciliary dental care

Project overview

Project start	**2019**	
Calculated end	2023	
Grants awarded		
Source	SOF	Kamprads stiftelse, Region FTV Dalarna,
Year	2019	2021

Aim

The aim with this project is to develop domiciliary professional oral care. We will compare the effect of different regimens for domiciliary prophylactic professional oral care according to both content and frequency. The overall aim is to establish relevant recommendations for professional domiciliary prophylactic oral care.

Project description

Study 1 To evaluate the effect of domiciliary prophylactic professional oral care for care dependent nursing home living elderly, concerning resident´s oral health and oral care knowledge and attitudes in nursing staff.

Study 2 A systematic review to identify and evaluate interventions to control root caries progression in care dependent home living elderly.

Study 3 To evaluate the effect of domiciliary prophylactic professional oral care interventions for care dependent home living elderly, with focus on root caries progression and oral health related quality of life.

Study 4 To describe the oral microbiome in care dependent home living elderly.

Project status December 2021

Study 1 Published

Study 2 Review of included papers ongoing

Study 3 Enrollment of participants ongoing

Study 4 Enrollment of participants ongoing

Publications

Girestam Croonquist C, Dalum J, Skott P, Sjögren P, Wårdh I, Morén E. Effects of Domiciliary Professional Oral Care for Care-Dependent Elderly in Nursing Homes - Oral Hygiene, Gingival Bleeding, Root Caries and Nursing Staff's Oral Health Knowledge and Attitudes. Clin Interv Aging. 2020 Aug 6;15:1305-1315.

2022-01-18

Principal Investigator:
Gunilla Sandborgh
Englund

Co-investigators:
Pia Skott
Elisabet Åkesson
Åke Seiger
Anita McAllister
Kerstin Johansson
Åsa Karlsson
Emmelie Persson

Title

5. Oral screens in post stroke training: a randomized clinical trial

Project overview

Project start	**2015**	
Calculated end	2021	
Grants awarded	3*425 000 SEK	
Source	SOF	
Year	2017-2019	

Aim

The aim is to investigate if 3 months of oral screen training will improve the swallowing capacity and the oral motor function in stroke patients with residual dysphagia 8-12 months after first stroke, in comparison to controls.

Project description

Stroke is a common disease in older people, and often leads to various degrees of disability. Dysphagia is one such consequence which is associated with aspiration pneumonia and malnutrition. There are studies showing that oral screen-training may reduce dysphagia, but the method is insufficiently evaluated. Since treatment with an oral screen is easy, relatively quick and cheap, it is of high relevance to perform a strict and unbiased study to assess the feasibility and efficacy of the intervention. Thus, the aim of the present study is to evaluate the effect of daily oral screen training in post-stroke patients with dysphagia.

We will perform a randomized controlled clinical study in subjects who have had a first stroke 8-12 months earlier and suffer from dysphagia. The intervention consists of daily oral screen training for 3 months. In total 70 subjects will be

randomized to intervention or control. The change in swallowing capacity is the main outcome, and secondary outcomes are subjective swallowing problems, lip force, chewing function and quality of life.

Improved oral motor function and decreased dysphagia in post-stroke patients will result in an improved quality of life for the individual, and also reduce hospitalization and health care costs.

Project status December 2021

The inclusion period was terminated in May 2021. In total 26 patients participated in the study. The project will result in two papers.

Manuscript 1 is under preparation: "Orofacial training after stroke – a multiprofessional approach". Pia Skott, Elisabet Åkesson, Kerstin Johansson, Jesper Dalum, Emelie Persson, Åsa Karlsson, Åke Seiger, Anita McAllister, and Gunilla Sandborgh-Englund

Publications

-

Principal Investigator:
Mats Trulsson

Co-investigators:
Gunilla Sandborgh
Englund
Abhishek Kumar
Pia Skott
Tommy Cederholm
Kerstin Belqaid
Anastasios Grigoriadis
Kerstin Johansson
Elisabeth Rydwik
Anne Söderlund
Anders Wänman

2022-01-18

Title

6.	The MoWo-project - Mouth work-out to prevent malnutrition and sarcopenia

Project overview

Project start	**2018**	
Calculated end	2028	
Grants awarded	500 000	**1 140 000**
Source	Vinnova UDI 1	VR Klinisk behandlingsforskning
Year	2018	2020

Aim

Our long-term goal is to prevent malnutrition which is caused by impaired chewing and swallowing function. Together with dietary advice and an incentivization for behavioural change, mouth workout exercises have the potential to reduce malnutrition in older people. The aims for Phase I (2021-2023) are to determine physiological predictors of good chewing, swallowing and eating behaviours, identify the phenotype profiles of people with chewing and swallowing impairments and estimate the prevalence of people with such problems.

Project description

Ageing causes reduction in muscle mass and strength including the muscles responsible for chewing and swallowing movements. Older people with chewing

and swallowing problems often choose to eat a poor diet of "coffee and sweet bread" instead of vegetables, meat and other nutritious, fibrous and protein rich food. The change of dietary patterns is gradual and often unnoticed by the healthcare. Recent research has shown evidence of a vicious cycle involving decreased muscle mass and strength (sarcopenia), chewing and swallowing problems and malnutrition. Here we present a two-phase project to disrupt this vicious cycle. During phase I we will determine the physiological predictors of chewing, swallowing and eating behaviours and identify people with impairments. We will also determine the prevalence of chewing and swallowing impairments and strengthen our multidisciplinary network comprising of researchers from dentistry, swallowing experts, dietitians, physiotherapists and experts is malnutrition and sarcopenia. During phase II we will perform interventional studies on stratified groups identified in phase I and employ a multispecialty clinical approach. This includes mouth workout exercises, diet counselling, and behavioural modifications. We propose that our holistic approach will optimize chewing and swallowing function, improve eating behaviour, and subsequently prevent malnutrition in the older population.

The cross-sectional observational study planned for Phase I will include patients ≥65 years, with no current need of dental treatment that are able to fill in the questionnaires and perform the clinical tests. Phase I is explorative and does not have a primary outcome for hypothesis testing. A convenient sample of 300 participants (equal number of men and women) will be recruited for the study. Our estimation assumes that perhaps 30% will have swallow/chewing problems. A number of Subjective (OHIP, EAT10, MNA) and objective measurements (oral status, bite forces, tongue and lip forces, saliva secretion, TOMASS, food comminution test, mixing ability test, swallowing capacity test, grip force, arm and calf muscle circumference, etc) will be collected in order to identify the phenotype profiles of people with chewing and swallowing impairments.

Project status December 2021

A systematic review on chewing as a physiological contributor to the processes of swallowing, digestion, and nutrition has been submitted and is under revision.

Phase I: Enrolment of elderly persons for the observational study in Phase I is ongoing at the ACT-clinic. So far, data have been collected from 25 participants.

Phase II: To be started 2023

Publications

Bozorgi C, Holleufer C, Wendin K. Saliva Secretion and Swallowing—The Impact of Different Types of Food and Drink on Subsequent Intake. Nutrients 2020, 12, 256; doi:10.3390/nu12010256

Principal Investigator:
Gunilla Sandborgh
Englund

Co-investigators:
Inga-Lena Nilsson
Fredrik Granath
Duangjai Lexomboon
Henrike Häbel
Kåre Buhlin
Mina Tägt (master
student)

2022-01-18

Title

7.   Primary hyperparathyroidism and oral health

Project overview

Project start	**2018**	
Calculated end	2024	
Grants awarded		
Source		
Year		

Aim

The main objective of the present research program is to study the effects of primary hyperparathyroidism (pHPT) on oral health.

Specific aims:

- To explore to what extent the oral health of pHPT patients is affected by the disease, with focus on periodontal health
- To determine if pHPT entails the loss of teeth, and if this is dependent on the severity of the disease
- To form a basis for assessment of pHPT patient's need of targeted dental support and interventions

Project description

The project is a nationwide register based study, with high power to detect clinical effects by pHPT on oral health. A large cohort of pHPT patients and a control cohort are followed during three years prior to diagnosis through linkage of data from national and quality registers. The main outcomes are based on the characteristics

of pHPT disease and our previous results: the loss of teeth, and periodontal and endodontic disease. The research will form a basis for the assessment of pHPT patient's need of prophylactic measures to avoid disease-related oral complications and may potentially contribute to the detection of pHPT in dental care.

Project status December 2021

We have finalized a pilot study investigating the effects of pHPT on oral health before the diagnosis and treatment of the disease. The main finding was that severe pHPT is associated with a higher risk of tooth loss during three years prior to the diagnosis and treatment of pHPT. Now we are working on a large nationwide dataset to explore if the effects on oral health remain also after PTX and normalization of the calcium homeostasis.

The manuscript is under preparation and will be included in a Master-thesis

Publications

Koman A, Nasman P, Discacciati A, Ekbom A, Nilsson IL, Sandborgh-Englund G. 2020. Increased risk for tooth extraction in primary hyperparathyroidism and hypercalcemia: A population study. Clin Oral Investig. 24(8):2755-2761.

Principal Investigator:
Anastasios Grigoriadis

PhD student
George Homsi

Co-investigators:
Abhishek Kumar
Mats Trulsson

Title

8. Assessment of masticatory function in people with dental implants

Project overview

Project start	2016	
Calculated end	**2023**	
Grants awarded	3*425 000	
Source	SOF	
Year	2019-2021	

Aim

The present project aims to identify functional impairments of mastication in bimaxillary implant-supported fixed prostheses users. Specifically, the project aims to evaluate masticatory function subjectively and objectively and the effect of masticatory performance on the nutritional status in a elderly group with bimaxillary implant-supported fixed prostheses. The results of the implant group will be compared to an age matched control group with natural teeth.

Project description

Masticatory function is an important aspect of oral and over-all health. Prosthodontic/oral rehabilitation procedures should be designed to either maintain or restore adequate function. However, even if the possibilities to replace lost teeth has never been better anatomically and aesthetically, traditional replacement by prosthodontic means still fails to fully restore oral function.

In clinical practice, success of prosthetic treatment is mainly based on experienced subjective improvement and the patient's feedback regarding aesthetics and comfort. For instance, studies have detected a significant self-reported functional improvement among patients treated with fixed implant-supported prostheses. However, we hypothesize that orofacial function is impaired although edentulous people treated with bimaxillary implant-supported fixed prostheses reports full satisfaction.

To study masticatory performance, two different tests are to be performed: A standardized hard food comminution test and a mixing ability test. To avoid that inconsistencies in the test food will cause variations in measured behavioral variables, edible model foods with controlled rheological properties have already been produced in our laboratory. Physiological parameters of mastication will be analyzed. These parameters represent, for example, number of chewing cycles, number of particles, total area of the obtained particles, duration and number of chewing cycles needed for swallowing, etc. The mixing ability test will be performed using a two-color chewing gum mixing standardized test (Hue-Check Gum; Orophys GmbH Muri b). Through analysis in a software program (ViewGum; dHAL Software), the variance of Hue (VOH) will be obtained as an indicator of mixing ability and masticatory performance. The subjective masticatory ability is to be analyzed using questionnaires such as the Swedish version of Jaw Functional Limitation Scale (JFLS-20) and of Oral Health Impact Profile (OHIP-49). For the purpose of evaluating nutrition, the Risk Evaluation for Eating and Nutrition II, SCREEN II, which has been translated into Swedish will be used. In order to get a more comprehensive assessment of the nutritional status the Mini Nutritional Assessment (MNA) and three day diet chart will be analysed.

Three studies will be included in the thesis:

Study I: Assessment of masticatory function in older individuals with bimaxillary implant-supported fixed prostheses or with a natural dentition: A case control study

Study II: Subjective and objective evaluation of masticatory function in patients with bimaxillary implant-supported prostheses

Study III: Evaluation of masticatory function and nutritional status in people treated with bimaxillary implant-supported prostheses

Project status December 2021

Study I: Accepted 2021.

Study II: Manuscript to be submitted

Study III: Data have been collected. Statistical analysis and manuscript writing in progress.

Publications

Homsi G, Kumar A, Almotairy N, Wester E, Trulsson M, Grigoriadis A. Assessment of masticatory function in older individuals with bimaxillary implant-supported fixed prostheses or with a natural dentition: A case-control study. Accepted for publ in The Journal of Prosthetic Dentistry. 2021.