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# ACT Project catalogue

Revised April 2023

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	<b>Core group</b>	<b>ACT-affiliated researchers</b>	<b>Collaborators</b>	<b>PhD student</b>
<b>1</b>	<b><i>Frailtest/osteoporosis</i></b>	Pia Skott	Helena Salminen, Sven Nyrén, Holger Theobald, Grethe Jonasson, Åke Seiger	Charlotta Elleby
<b>2</b>	<b><i>Chew and think</i></b>	Mats Trulsson, Abhishek Kumar, Pia Skott	Erik Westman, Urban Ekman, Åke Seiger, Gunilla Sandborgh Englund	Linn Hedberg
<b>3</b>	<b><i>Domiciliary dental care</i></b>	Inger Wårdh, Pia Skott	Petteri Sjögren, Georgios Belibasakis, Niels Ganzer, Kristina Edman, Helena Domeij	Elisabet Morén
<b>4</b>	<b><i>Oral screen training post stroke</i></b>	Gunilla Sandborgh Englund, Pia Skott	Anita McAllister, Elisabet Åkesson, Jesper Dalum, Emmelie Persson, Åsa Karlsson, Åke Seiger	
<b>5</b>	<b><i>Chew and swallow/MoWo</i></b>	Abhishek Kumar, Mats Trulsson, Gunilla Sandborgh Englund, Pia Skott	Tommy Cederholm, Anne Söderlund, Kerstin Johansson, Kerstin Belqaid, Elisabeth Rydwick, Anders Wänman, Anastasios Grigoriadis	
<b>6</b>	<b><i>Assessment of masticatory function in people with dental implants</i></b>	Abhishek Kumar, Mats Trulsson	Anastasios Grigoriadis	George Homsí



**Principal Investigator:**  
Helena Salminen  
(Supervisor)

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## Title

**Co-investigators:**  
Charlotta Elleby  
(PhD student)

**1. New ways of identifying individuals at risk of frailty and fragility fractures**

Pia Skott  
Sven Nyrén  
Holger Theobald  
(Co-Supervisors)

## Project overview

<b>Project start</b>	2016	
<b>Calculated end</b>	2023	
<b>Grants awarded</b>		
<b>Source</b>	ACT FTV Stockholm	
<b>Year</b>	2016-2023	

Grethe Jonasson  
(Research collaborator)

## Aim

The aim is to study methods to identify individuals with augmented risk of frailty and fragility fractures in the dental setting, by assessing the trabecular bone structure in dental radiographs, questions about health status and mobility, comorbidity with other diagnoses, and using the FRAX-tool for fracture risk assessment.

## Project description

The REBUS cohort gives possibilities to study the predictive value of risk factors associated with fragility fractures during a follow-up of up to 47 years. Identifying high risk patients enables early onset of effective preventive treatments such as medication and physical activity, which would decrease both the suffering of individuals and high costs for the society. The first three studies are cohort studies with register data using the REBUS cohort. The purpose of the first study is to investigate if risk for future fractures can be determined by assessing the trabecular bone structure in dental intra oral radiographs in the dental part of the REBUS

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cohort. In the following two studies the purpose is to find additional risk factors for fragility fractures and frailty. In the fourth study, which is a qualitative study, we investigate patients' thoughts of having their ten-year risk of fragility fractures being assessed in conjunction with a dental appointment. This setting is a previously not identified possibility to find individuals with augmented risk of sustaining fragility fractures, and, hence, frailty. Dental radiographs are taken regularly on individual indication on a large part of the population and the dentists are familiar in analyzing them. The regular dental recall system for check-ups could also enable regular contact with a large part of the population. Altogether this could make the dental setting suitable for identifying patients at risk of fragility fractures and frailty.

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 association between questions about health status and mobility and hip fractures in the REBUS cohort during a 35-year follow-up using questions from the 1969 postal survey to over 30,000 participants.

**Study III:** Aim: A nested case control study of the 30 000 individuals from the original REBUS cohort, studying the association of certain medical diagnoses to fragility fractures during a follow-up of up to 47 years.

**Study IV:** Aim: A qualitative study to investigate patients' thoughts about having their fracture risk assessed in conjunction with a dental appointment using the risk assessment tool FRAX. Patients 65-75 years old in Stockholm Public Dentistry will be interviewed.

## Project status December 2022

Study I: Published in European Journal of Oral Sciences, E-pub May 2021.

Study II: Submitted manuscript

Study III: Remains: Statistical analysis and manuscript writing

Study IV: Submitted manuscript.

## 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.



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Elleby C, Skott P, Johansson S-E, Theobald H, Nyrén S, Salminen H: Long term association of hip fractures by questions of physical health in a cohort of men and women. (submitted for publication)

**Principal Investigator:**

Urban Ekman  
Mats Trulsson  
Abhishek Kumar

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**Title**

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

**Co-investigators:**

Linn Hedberg  
(PhD student)

Eric Westman

Åke Seiger

Pia Skott

Gunilla Sandborgh

Englund

**Project overview**

<b>Project start</b>	<b>2016</b>	
<b>Calculated end</b>	2025	
<b>Grants awarded</b>	6*425 000	
<b>Source</b>	SOF	
<b>Year</b>	2017-2019, 2020-2022, 2023-2025	

**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

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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 2022

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.

Paper 1: Published

Paper 2: Submitted manuscript

Paper 3: Under preparation

## 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.



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Hedberg L, Skott P, Smedberg J-I, Kåreholt I, Seiger Å, Sandborgh-Englund G, Engström Nordin L, Westman E, Kumar A, Trulsson M, Ekman U. Vascular changes mediate the association between mastication and cognition. (submitted to J Oral Rehab)





**Principal Investigator:**  
Inger Wårdh

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## Title

**Co-investigators:**

**PhD student** Elisabeth  
Morén

**3. Domiciliary dental care**

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

## Project overview

<b>Project start</b>	2019	
<b>Calculated end</b>	2023	
<b>Grants awarded</b>		
<b>Source</b>	SOF	Kamprads stiftelse, Region FTV Dalarna,
<b>Year</b>	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.

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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 2022

Study 1 Published

Study 2 In manuscript

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.

**Principal Investigator:**

Gunilla Sandborgh  
Englund

**Co-investigators:**

Pia Skott  
Elisabet Åkesson  
Åke Seiger  
Anita McAllister  
Kerstin Johansson  
Åsa Karlsson  
Emmelie Persson

## Title

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

## Project overview

<b>Project start</b>	2015	
<b>Calculated end</b>	2021	
<b>Grants awarded</b>	3*425 000 SEK	
<b>Source</b>	SOF	
<b>Year</b>	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

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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 2022

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

Skott P, Åkesson E, Johansson K, Dalum J, Persson E, Karlsson Å, Seiger Å, McAllister A, Sandborgh-Englund G: Orofacial dysfunction after stroke – a multidisciplinary approach. (Reviderad version insänd; Gerodontology)

Skott P, Åkesson E, Johansson K, Dalum J, Persson E, Karlsson Å, Seiger Å, McAllister A, Sandborgh-Englund G: Effect on Orofacial dysfunction after stroke by Oral screen training. (Under preparation)

## Publications

Skott P, Åkesson E, Johansson K, Dalum J, Persson E, Karlsson Å, Seiger Å, McAllister A, Sandborgh-Englund G: Orofacial dysfunction after stroke – a multidisciplinary approach. (Reviderad version insänd; Gerodontology)



**Principal Investigator:**  
Mats Trulsson

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## Title

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

**Co-investigators:**

Gunilla Sandborgh  
Englund  
Abhishek Kumar  
Pia Skott  
Tommy Cederholm  
Kerstin Belqaid  
Anastasios Grigoriadis  
Kerstin Johansson  
Elisabeth Rydwick  
Anne Söderlund  
Anders Wänman

## Project overview

<b>Project start</b>	<b>2018</b>	
<b>Calculated end</b>	2028	
<b>Grants awarded</b>	500 000 640 000 975 000	
<b>Source</b>	Vinnova UDI 1 VR Klinisk behandlingsforskning SOF	
<b>Year</b>	2018-2020 2021-2022 2022-2024	

## 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 in 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  $\geq 65$  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 2022

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, at FTV clinics in Stockholm and at clinics in Västra Götaland. So far, data have been collected from 190 participants.

Phase II: Planning phase, 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

Kumar A, Almotairy N, Merzo JJ, Wendin K, Rothenberg E, Grigoriadis A, Sandborgh-Englund G, Trulsson M. Chewing as a physiological contributor to the processes of swallowing, gastrointestinal and nutrition-related parameters: A systematic review. *Critical Reviews in Food Science and Nutrition*.  
<https://pubmed.ncbi.nlm.nih.gov/35837677/>

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**Principal Investigator:**  
Anastasios Grigoriadis

**PhD student**  
George Homsí

**Co-investigators:**  
Abhishek Kumar  
Mats Trulsson

## Title

**6. Assessment of masticatory function in people with dental implants**

## Project overview

<b>Project start</b>	2016	
<b>Calculated end</b>	2023	
<b>Grants awarded</b>	3*425 000	
<b>Source</b>	SOF	
<b>Year</b>	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



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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 2022

**Study I: Published.**

**Study II: Published**

**Study III: In manuscript**

## **Publications**

Homs 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.

Homs G, Karlsson A, Almotairy N, Trulsson M, Kumar A, Grigoriadis A. Subjective and objective evaluation of masticatory function in patients with bimaxillary implant-supported prostheses. J Oral Rehabil. 2023 Feb;50(2):140-149.  
<https://pubmed.ncbi.nlm.nih.gov/36415039/>