

HESAV-SCHOOL OF HEALTH SCIENCES

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# HEALTH TECHNOLOGY AND BIOTECHNOLOGY

Multidisciplinary research, serving the health care field



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## Health technology and biotechnology

When research results lead to the development of devices, instruments or techniques in the health care field.

Development projects make it possible to build bridges between research results and practice through instruments and techniques that can have direct impacts in improving health care interventions as well as in furthering the autonomy of individuals. Project development mostly takes place in two areas: protocols and techniques used in health care institutions on the one hand, and conjoint work with the field of engineering on the other.

### Engineering and health

In order to better mobilize interdisciplinary skills, HESAV and the HEIG-VD have created the ingénierie&santé (engineering&health) platform. The platform's goal is to offer an optimal framework within which to promote the development of technological devices and tools that require both a high level of expertise in the health field and various kinds of specialized input from the field of engineering.

Our projects offer a broad range of technological developments tailored for the health field and for health care professionals; they range from projects focusing on robotic training systems for hemiplegic patients through serious game applications adapted to their specific needs, to the development of IT applications enabling continuous mobile access to biomedical information by emergency services teams, and to the use of Tarmed (medical billing) data to measure the level of irradiation in a population.

Similarly, specific tools are being developed for teaching, such as e-learning platforms and software designed for the use of digital images in the professional education of radiology and medical imaging technologists.

## Current research

E-NEO: Developing the skills and knowledge of neonatal resuscitation students with a collaborative e-learning module in Switzerland and Lebanon.

CLAIRE DE LABRUSSE

In collaboration with  
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With support from  
Commission scientifique du domaine santé HES-SO, HESAV

With support from  
Leading House for the Middle East and North Africa

Neonatal resuscitation is a key element of the newborn care in the delivery room. In 2014, the Lancet Series on Neonatal Survival proposed new targets to accelerate the reduction of neonatal mortality (Sustainable Development Goal 3) which still affects approximately 2.9 million newborns worldwide, or 4, 5 per 1000 live births in Lebanon, and 3 per 1000 live births in Switzerland. One of the success factors in the management of resuscitation procedures is the competence of the caregivers to prepare the appropriate equipment, as well as their expertise to perform resuscitation procedures.

Training by E-Learning was chosen for its many educational advantages conducive to skills development. This not only impacts the knowledge and skills of students, but also the health of at-risk newborns and their families. By the assignment of their duties in the delivery room, midwives and nurses are on the forefront of births. Moreover, it has been shown, both in the training of midwives in neonatal resuscitation at the Haute Ecole de Santé Vaud (HESAV) and in Lebanese training, that no specific emphasis is placed on the preparation of the resuscitation table. Therefore, training with an e-learning module to acquire knowledge in a structured way in neonatal resuscitation, while exercising its critical sense seems particularly suitable for students. Scientific cooperation between Switzerland and Lebanon, with the same objectives of training and improving the health of newborns is proposed in this project.

The objective of the E-NEO project is to develop the skills and knowledge of neonatal resuscitation students with a collaborative e-learning sequence in Switzerland for midwifery and nursing students (respectively in 2nd and 3rd year of Bachelor) ; and in Lebanon (respectively 3rd/4th and 3rd Bachelor).

## The Birth of a Father, extension of an existing project

YVONNE MEYER

In collaboration with  
Gilles Crettenand (Maenner.ch)  
Remo Ryser (Maenner.ch)

With support from  
Promotion Santé Suisse,  
Soutien à des projets  
d'action cantonaux (PAC)



Gesundheitsförderung Schweiz  
Promotion Santé Suisse  
Promozione Salute Svizzera

There is minimal information and awareness tools for men who are becoming fathers. However, the scientific literature argues unanimously that the committed involvement of partners significantly improves the well-being and health of the whole family. That is why in 2018 two midwives of HESAV, in partnership with a specialist in the field of paternity from the Männer.ch Association, produced the film «The birth of a father». This documentary, conceived in 5 episodes, traces the diversity of realities which contribute to the process of becoming a father. The 18 fathers interviewed present themselves frankly. In addition, 14 professional representatives of the perinatal professions discuss the conducive practices aimed at the inclusion of fathers in their practice. The press's coverage of the film's release included the following review: «It is not always easy for these men to be recognized by perinatal professionals as a parent in their own right. Young fathers, caregivers and specialists testify «(Cooperation 01.04.19). Thanks to the support of Health Promotion Switzerland, this project, initiated in French speaking part of Switzerland, will be extended to the all country and even more widely on the web. To do this:

- the film will be subtitled in English, German and Italian,

-

10 meetings «in the presence» of fathers, future fathers, mothers and future mothers will be organized in collaboration with various organizations, mainly in the cantons of Bern, Zurich and Basel. These meetings aim, through the film, to encourage exchanges about practices where fathers can get involved with their partner and the baby, about the organization and distribution of tasks at home, about the care of the baby, about the paternity leave, etc.

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a workshop for perinatal professionals will address the decentralization of the dominant socio-health model with its strong focus on maternal and child care, to discuss more inclusive family practices

Media coverage will accompany the project. Otherwise, the salient elements collected during the meetings and workshop will be included in the final report.

Spinal kinematics and pain-related fear in chronic low back pain: a cohort study.

GUILLAUME CHRISTE

In collaboration with  
Julien Favre  
(co-director of Swiss  
BioMotion Lab, CHUV)  
Brigitte Jolles-Haerberli  
(co-director of Swiss  
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With support from  
Commission scientifique du  
domaine santé HES-SO.

**Hes·so**

Haute Ecole Spécialisée  
de Suisse occidentale

Fachhochschule Westschweiz  
University of Applied Sciences  
Western Switzerland

Chronic low back pain (CLBP) is one of the most frequent causes for limitations in daily, leisure and work-related activities. Alterations in spinal kinematics have consistently been reported in patients with CLBP, suggesting that this factor could contribute to the chronicity of pain and disability. Psychological factors, such as pain-related fear, have been described as a possible main cause of kinematic alterations in CLBP. While it is known that pain-related fear can drastically decrease during a rehabilitation program, it is not known to which degree it influences spinal kinematics.

Therefore, this study will test patients with CLBP before and after a 3-weeks multimodal rehabilitation program to investigate if a decrease in pain-related fear is associated with spinal kinematics improvements.

This study will advance our understanding of the relationships between psychological and physical factors in CLBP physiopathology. Ultimately, a better comprehension of the underlying mechanisms involved in CLBP rehabilitation will help enhance care for patients suffering from back pain.

Non-invasive reinforcement of the upper airway dilator muscles as an alternative approach to treat patients with obstructive sleep apnea.

OLIVIER CONTAL

In collaboration with  
William Poncin (HESAV)  
Raphael Heinzer (CHUV)

With support from  
Commission scientifique du  
domaine santé HES-SO.

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Fachhochschule Westschweiz  
University of Applied Sciences  
Western Switzerland

Continuous positive airway pressure (CPAP) is an effective therapy and the first-line treatment option offered to patients with OSA. However, between 20-60% of patients with severe OSAS do not comply with CPAP and remain untreated. Alternative treatment options have therefore been investigated such as positional therapy, mandibular advancement devices and sometimes surgical treatments, but demonstrated little benefit in moderate-to-severe OSAS. In this context, reinforcement of the upper airway dilator muscles appear to be a promising therapeutic strategy.

The main objective of this study is to assess the effectiveness of a simple and quick myofunctional reeducation protocol of the tongue in reducing the OSAS severity.



3. On a macro level, attention will be brought to institutional changes and the normalisation work that will come from these changes.

These three levels of analysis will allow us to jointly seize the evolution of training today in the field of ageing in institutions, as well as more general social reforms that this evolution stems from and participates in.

## Current PhD research

### Spinal kinematics and chronic low back pain.

GUILLAUME CHRISTE

Director of thesis  
Faculty of Biology and  
Medicine,  
University of Lausanne.

Co-Director of thesis  
Dr. Julien Favre  
Swiss BioMotion Lab,  
CHUV.

Although chronic low back pain (CLBP) is a common medical condition, with major societal repercussions, its pathomechanism is still poorly understood. The contemporary understanding of CLBP suggests a multidimensional nature of the condition, particularly an interrelation between psychological and physical factors. This doctoral project aims at better understanding some underlying mechanisms in this complex condition, focussing on one possible cause of persistence of symptoms and disability in CLBP, spinal kinematics alterations (spinal movements). Furthermore, it aims at examining the relationship between spinal kinematics and psychological factors, such as kinesiophobia.

### General objectives:

1. To improve our understanding of spinal kinematics alterations in CLBP patients.
2. To analyse the association between spinal kinematics and pain or disability.
3. To analyse the association between psychological variables and spinal kinematics.
4. To develop strategies to improve spinal kinematics in CLBP patients.

### Methods

Pain-free subjects and patients with chronic low back pain will come to a movement analysis laboratory several times (for some, before and after a multidisciplinary rehabilitation program). Sensors will be installed on the back of the participants and their spinal kinematics will be measured during various movements and activities of daily life (walking, getting up from a chair, ...).

## Validation of a kinematic functional shoulder score including only essential movements.

CLAUDE PICHONNAZ

Director of thesis  
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Rehabilitation Sciences  
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Collaborations  
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Prof. Alain Farron and Prof. Brigitte JollesHaeberli (Département de l'appareil locomoteur CHUV)  
Estelle Lécureux (Direction médicale CHUV)  
Dr. Cyntia Duc and Prof. Kamiar Aminian (LMAM-EPFL)

With support from SNSF, n°135061

Measurement of shoulder function is a controversial issue. There is a great variety of measurement tools but none of them has been universally accepted. There is therefore a need to develop extensively validated and convenient measurement tools. Embedded computerized movement analysis can potentially meet these requirements for measurement of shoulder function. Ambulatory measurement devices allow application in various clinical conditions, display adequate precision and accuracy, and are considerably more straightforward than laboratory-based systems. Using a Physilog® II embedded system, Coley (2007) developed a relatively simple score of shoulder function (P Score). The method is based on arm power measurement by three-dimensional accelerometers and gyroscopes during seven consecutive shoulder movements. It demonstrated reliability, responsiveness and criterion-based validity. However, additional knowledge and technological progress could now contribute to further simplification of the. A secondary analysis of Coley's study data based on principal component analysis and multiple regressions highlighted that a procedure including only two selected movements produces comparable results to P Score. Moreover, the development of wireless systems considerably simplifies set up. Consequently, simpler but equivalent measurement procedure can now be considered. However, this new approach has now to undergo extensive validation to precisely establish its measurement properties.

### Aim

The aim of the study is to establish measurement properties of a simplified shoulder functional kinematic score, considering scope of application in shoulder pathologies, intra- and inter-observer reproducibility, responsiveness, minimal clinically important difference and criterion-based validity.

### Methods

A clinical validation study is planned. Measurement will be carried out with four groups of patients representative of frequent shoulder conditions (rotator cuff condition, shoulder instability, diaphyseal or subcapital humerus fracture, frozen shoulder) and a control group free from any shoulder condition. Measurement procedure includes two consecutive measurements, alternatively conducted by two evaluators at baseline, and an additional single measurement 6 months later. Currently used functional questionnaires will be completed at both stages.

Analysis will address intra- and inter-observer reproducibility, responsiveness, minimal clinically important difference and criterion-based validity, respectively for the four considered shoulder conditions.

Health policies on preventing the transmission of Chagas parasite in Switzerland and experiences of migrant pregnant women from Latin America.

ELISE RAPP

Director of thesis  
Prof. Francesco Panese  
Faculty of Social and Political Sciences & Faculty of Biology and Medicine,  
University of Lausanne

Co-director of thesis  
Prof. Raphaël Hammer  
School of Health Sciences,  
HESAV

Health policies on preventing Chagas transmission during pregnancy in non-endemic countries are usually poorly developed. In Switzerland, although the population is protected from parasite transmission by blood transfusion surveillance and organ donation measures, medical control of Chagas parasite transmission during pregnancy is only practiced in Geneva and Lausanne.

Thus, the absence of a national screening policy for Chagas disease during pregnancy raises the issues of how public health priorities are elaborated.

Furthermore, little is known about the experiences of pregnant women who are screened and monitored for a Chagas disease. In a context of migration, health can be a topic in competition with other concerns (financial, housing ...), moreover, the diagnosis of Chagas can be experienced as a factor of stigma and discrimination. Finally, this silent infection present an uncertain evolution towards a disease and treatments are not very effective at the chronic stage. Pregnant women could face a dilemma between being screened for the benefice of their children's health and not wanting to know their own parasitological status.

Drawing on semi-structured interviews with Latin American migrants and Healthcare providers, I examine two questions:

1. What are the socio-political determinants that influences the policy around the prevention of Chagas parasite transmission in Switzerland ?
2. How women experiences the screening and monitoring of the Chagas disease in a context of maternity ?

The aim of this research is to observe how a migrant population perceives its disease and the health system in order to highlight the obstacles and factors influencing the care process and to adapt the professional practice according to the needs expressed or identified. This thesis will also lead to a societal reflection on issues of prevention policies and their impact on migrant populations in general, as well as on innovations and social processes that lead to their uses or their rejections.

## Completed research

**Yvonne Meyer**

In collaboration with  
Gilles Crettenand

**(HESAV & Männer.ch)**

**Magali Bonzon (HESAV)**

End 2019

Providing support for future fathers as actors in the birth.

**Corinne Schaub**

In collaboration

**Catherine Bigoni (HESAV)**

Alexia Stantzog

(DP-CHUV/SPN)

Bruno Deschamps

(DP-CHUV/SPN)

End 2019

Identifying the complementary and integrative medicine (CIM) practices of healthcare professionals in canton Vaud's Northern Psychiatric Sector (DP-CHUV/SPN) and the individual determiners of their intention to use CIM.

**Emmanuelle Opsommer**

In collaboration with

**Natalya Korogod (HESAV)**

End 2018

Mental practice for chronic pain in people with spinal cord injury: A systematic review.

**Sandrine Ding**

In collaboration with

**Nicole Richli Meystre (HESAV)**

**Cosmin Campeanu (HESAV)**

Giuseppe Gullo (CHUV)

End 2016

The effectiveness of interventions to prevent or reduce Contrast Media Extravasations among patients undergoing computerised tomography scanning: a systematic review protocol.

**Emmanuelle Opsommer**

In collaboration with

**Camille Zwissig (HESAV)**

Thomas Weiss (University of Jena, Germany)

End 2016

Effectiveness of temporary deafferentation of the arm on somatosensory and motor functions following stroke: a systematic review.

**Nicolas Perret**

In collaboration with

Rolf Firschknecht (CHUV)

End 2016

A new robotic parallel kinematic system (LHS) for the training of lower limbs in hemiplegic patients: a feasibility study.

**Claude Pichonnaz**

In collaboration with

**Jean-Philippe Bassin (HESAV)**

**Guillaume Christe (HESAV)**

Cynthia Duc (LMAM-EPFL)

Ali Djahangiri (CHUV-UNIL)

Alain Farron (CHUV)

End 2014

Reliability of a kinematic functional shoulder score including only two movements.

### Régis le Coultre

In collaboration with  
Leonor Alamo Meystre (UNIL)  
Ariane Boubaker (UNIL)  
Sabine Schmidt Kobbe (UNIL)  
**Jennifer Pilot (HESAV)**  
End 2014

Management of upper extremity function  
in patients with hemiparesis after stroke.  
Synthesis of recommendations.

## Completed PhD research

### Jean-Bernard Michotte

Director of thesis  
Dr. Grégory Reychler  
Cliniques Universitaires Saint-Luc (UCL) -  
Belgium  
  
End 2016

Evaluation of non invasive positive pressure  
ventilation combined to nebulization on  
lung deposition measured by urinary excre-  
tion of amikacin.



All research can be found on the website of HESAV

<http://recherche.hesav.ch>



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