

# From a field ergonomic work exposure analysis to the implementation of a worksite adapted physical activity program for the prevention of work related musculoskeletal disorders of the low back among vineyard-workers

by

**Romain Balaguier**

Work related musculoskeletal disorders (WMSDs) affecting the low back do represent a major health issue and challenge among workers in Europe including vineyard workers. It is noteworthy that the negative effects of WMSD at the individual, employer and societal levels make the prevention of WMSDs affecting the low back a priority in the viticulture sector. Within this context, the aim of this PhD thesis was to conduct an effective action to prevent WMSDs symptoms of the low back among vineyard workers.

An ergonomic work exposure field analysis was first conducted (i) to question the location and severity of WMSDs symptoms and (ii) to objectively quantify the kinematics during pruning activity. Of note, this winter activity was chosen because it represents six months per year of physical workload. To reach this first sub-objective, two complementary studies were conducted (Studies I and II). In Study I, self-reported musculoskeletal pain ratings confirmed the existing literature showing that the low back is the most painful anatomical region among vineyard workers. In addition, two dimensional video-recordings of pruning activity revealed that vineyard workers frequently adopt trunk forward bending postures considered as 'extreme'. In Study II, the use of wireless tri-dimensional inertial sensors further demonstrated that pruning activity was also associated with trunk postures combining forward bending and rotation. As a whole, these two field studies indicated that vineyard-workers adopted trunk postures known to increase the risk of WMSDs symptoms over the low back during the execution of pruning activity.

Based on these findings, a workplace supervised adapted physical activity (APA) program was subsequently conceived, implemented and evaluated to specifically prevent WMSDs symptoms of the low back among vineyard-workers. The APA program was supplementary to classical ergonomics interventions. To achieve this second objective, two complementary studies (Studies III and IV) were performed in which volunteered vineyard workers were proposed to follow supervised warm-ups and training APA sessions targeting trunk muscle endurance and flexibility. The results of Study III showed the effectiveness of this workplace supervised APA program to increase trunk muscle endurance and flexibility and to decrease pressure pain sensitivity over the low back, hence evidencing the positive effects of APA on pain mechanisms. Results of Study IV further provided a comprehensive view on how and to what extent the context of the implementation of the APA program and the collaboration between stakeholders were decisive to reach high compliance rate and were likely to increase the program's effectiveness.

In summary, this PhD thesis demonstrated that work exposure analysis performed in situ and a supervised workplace APA program can help to prevent WMSDs symptoms of the low back among vineyard-workers. Interestingly, even though the question of sustainability still remains to be assessed, these promising results have convinced other vine-companies to integrate this APA program as one component of their health policies already including ergonomics approaches.

# From a field ergonomic work exposure analysis to the implementation of a worksite adapted physical activity program for the prevention of work related musculoskeletal disorders of the low back among vineyard-workers

**Ph.D. lecture**

by

**Romain Balaguier**

**Friday 23 February 2018**



**DEPARTMENT OF HEALTH SCIENCE AND TECHNOLOGY**  
AALBORG UNIVERSITY

This thesis is based on Romain Balaguier's research work at:



**UGA and SMI, AAU**

To fulfill the requirements for the Ph.D. degree, Romain Balaguier has submitted the thesis: From a field ergonomic work exposure analysis to the implementation of a worksite adapted physical activity program for the prevention of work related musculoskeletal disorders of the low back among vineyard-workers, to the Faculty Council of Medicine at Aalborg University.

The Faculty Council has appointed the following adjudication committee to evaluate the thesis and the associated lecture:

**Professor Gisela Sjøgaard**  
**University of Southern Denmark**  
**Denmark**

**Attending Physician, Senior Lecturer Stéphane Genevay**  
**University Hospitals Geneva**  
**Germany**

**Chairman:**  
**Professor Uwe G. Kersting**  
**Aalborg University**  
**Denmark**

**Moderator:**  
**Professor Pascal Madeleine**  
**Aalborg University**  
**Denmark**

The Ph.D. lecture is public and will take place on:

**Friday 23 February 2018 at 14:00**  
**Château Larose-Trintaudon**  
**D206, route de pauillac,**  
**lieu dit Trintaudon,**  
**33112 Saint-Laurent-Médoc**  
**France**

## **Program for Ph.D. lecture on**

**Friday 23 February 2018**

**by**

**Romain Balaguier**

Studies on itch and sensitization for itch in humans

Chairman: Professor Uwe G. Kersting

Moderator: Professor Pascal Madeleine

14.00 Opening by the Moderator

14.05 Ph.D. lecture by Romain Balaguier

14.50 Break

15.00 Questions and comments from the Committee  
Questions and comments from the audience at the  
Moderator's discretion

17.00 (No later than)  
Conclusion of the session by the Moderator

After the session a reception will be arranged