



## Press kit

Paris. 18/04/2012



Sport/physical exercise and health:  
What's new?



The London Olympic Games kick off on July 27th. With around 100 days to go, Inserm wishes to invite you to look into the research that has been done in the fields of sport and health.

Various research programs over the last few years have shown the benefits of physical exercise on our health, in preventing obesity or in improving the health of patients suffering from chronic, cardiovascular or respiratory diseases in particular.

So what about high-level sports? These also seem to contribute to good health. Are high-level sport and physical exercise both determining factors for our health?

Several research teams in France specializing in epidemiology, sports medicine, physiology and physics are investigating the interactions between sport, physical exercise and health.

Below you will find contacts and detailed information about some of the Inserm teams involved in the fields below, among others:

- ➔ The impact of performance on life expectancy and mortality
- ➔ The part played by high-level athletes as models for studying respiratory diseases
- ➔ The rules of training for competitive sports transposed to physical exercise (notions of gradual build-up, development of different sporting energy systems, regularity, variations in exercises, motricity, assessment, etc.)
- ➔ Sport and aging
- ➔ Differences in the cardiac system of high-level athletes

**For more information**

Photographic resources: <https://serimedis.inserm.fr>

Press contacts

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## Sport and physical exercise: how do they affect health?

→ **Jean-François Toussaint, Director of the IRMES (Institute for Biomedical and Epidemiological Research in Sport, INSEP structure (National Institute of Sport, Expertise and Performance), University Paris Descartes, public hospitals & Inserm**

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- Prevention through physical activity at the workplace: measurement of the number of steps taken daily over one week. (Collaboration between IRMES and Peugeot SA)
- Context and evolution of sporting records: What are the historical statistics; how does physique evolve? What impact do environmental disturbances have?
- Parameters of performance evolution: High-level sport and assessment of factors that determine career longevity and life expectancy

### **A few reference documents**

- A double exponential dependence toward developmental growth and time degradation explains performance evolution in individual athletes and human species. 2011, <http://dx.doi.org/10.1007/s11357-011-9274-9>

- - [Success and Decline: Top 10 tennis players follow a biphasic course](http://dx.doi.org/10.1249/MSS.0b013e31821eb533). *Med Sci Sport Exer.* 2011, <http://dx.doi.org/10.1249/MSS.0b013e31821eb533>

- Toussaint JF, Swynghedauw B. Croissance et renoncements: vieillir à l'épreuve du temps. *Esprit*, July 2010; 366: 60-74

- How they won rugby World Cup through height, mass and collective experience; *Br J Sports Med* 2012, <http://dx.doi.org/bjsports-2011-090506>

- Psychopathology within high level sport: gender-based differences and sport-specific patterns. *PLoS ONE*. 2011 <http://dx.doi.org/10.1371/journal.pone.0019007>

- Sports-related sudden death in the general population. *Circulation*, 2011 ; 124: 672-81

- HFE mutations associated with high level sport performance. *Hematologica*, 2011, 96(2): 229

- Evaluation of a Randomized Control Trial in the Management of Chronic Lower Back Pain in a French automotive industry: an Observational study. *Arch Phys Med Rehab*, 2011; 92: 1927-36



## Physical activity training: the most important thing is to dose it right

→ **Martine Duclos, Head of the Sports Medicine department at the Clermont- Ferrand University hospital, endocrinologist and physiologist**

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- Obesity and physical activity: a cohort study on obesity and metabolic syndrome Monitoring and quantifying the effect of types of activity. The impact of sedentary behaviour.
- Muscles, a health factor: the importance in preserving muscle mass in obese and diabetic patients.
- New physical activity recommendations and type 2 diabetes by the SFD (the French Society of Diabetes)
- Sport and women: a matter of dose or diet? Muscle-bone relationships.

### **A few reference documents**

- Physical activity and cancer: it is never too late to get moving!" in "Topics in Cancer Survivorships", Ed. Nova Science Publishers, New York, 2012.
- Bone geometry and strength adaptations to physical constraints inherent in different sports: comparison between elite female soccer players and swimmers. *J Bone Miner Metab.*, 2011
- Bone health during late adolescence: effects of an 8-month training program on bone geometry in female athletes. *Joint Bone Spine* 2012
- Effect of time interval between food intake and physical exercise on substrate oxidation during physical exercise in obese and lean children. *Clinical Nutrition* 2011
- Detraining-induced alterations in metabolic and fitness markers after a multicomponent physical exercise-training program in older men. *Appl Physiol Nutr Metab* 2012.
- Oral contraception and energy intake in women: Impact on substrate oxidation during physical exercise. *Appl Physiol Nutr Metab* 2012

→ **Samuel Verges, Research team leader at Inserm, Unit 1042 "Hypoxia and cardiovascular and respiratory physiopathologies", Grenoble**

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- Theory and practice of physical exercise: from athlete to patient. Performance-limiting mechanisms (parallels between the respiratory system of athletes and that of respiratory disease patients), the athlete at altitude and the hypoxemic respiratory patient.
- Assessment of an athlete's endurance performance versus assessment of a patient's intolerance to effort: endurance assessment and neurostimulation techniques.
- Endurance training techniques of the athlete applied to patients: training of respiratory muscles, electrostimulation, etc.

### **A few reference documents**

- Electrostimulation pour patients atteints de maladies respiratoires. *Electrical stimulation for testing neuromuscular function: from sport to pathology. Eur J Appl Physiol* (2011)
- Entraînement spécifique des muscles respiratoires chez le patient obese: *Respiratory muscle endurance training in obese Patients IJ of O* (2010)
- Entraînement avec aide ventilatoire: *Home physical exercise training with non-invasive ventilation in thoracic restrictive respiratory disorders: A randomised study Respiratory Physiology & Neurobiology* (2009)



## Physical activity, can sport make you live better and longer?

→ **Patricia Dargent Molina, Research Director at Inserm, Unit 953, “Epidemiological research into perinatal health and women’s and children’s health” Paris**

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The “Ossebo” study: a randomized control study aimed at maintaining balance and preventing falls and fractures through physical exercise in women aged 75 and over living at home.

Results of a preliminary analysis after 1 year (not yet published): There was a significant improvement in the physical capabilities of the women in the group who attended the sessions.

→ **Romuald Lepers, Inserm Unit 1093 “Cognition, action and sensorimotor plasticity”, Dijon**

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- Age-sex interaction between performance and endurance.
- Will women one day surpass men in certain sports like the marathon?
- What are the performance limits in “senior” athletes?
- What factors limit their endurance performance: muscle fatigue and/or mental fatigue? (a one-hundred year old recently ran the marathon in 8 hours 30 minutes).

### ***A few reference documents***

- *Age-related changes in 100-km ultra-marathon running performance* 2011, AGE <http://dx.doi.org/10.1007/s11357-011-9290-9>

- *Relative improvements in endurance performance with age evidence from 25 years of Hawaii Ironman racing*, 2012, AGE <http://dx.doi.org/10.1007/s11357-012-9392-z>

- *Do older athletes reach limits in their performance during marathon running?*, AGE, 2011 <http://dx.doi.org/10.1007/s11357-011-9271-z>



## Links between living environment and physical activity

→ **Jean Michel Oppert, H el ene Charreire, lecturers at the Universit e Paris Est Cr eteil. Inserm unit 557 “Nutritional epidemiology”, Inra U1125, Cnam, Universit e Paris 13, CRNH Ile-de-France (Director Pr. S Hercberg)**

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The ELIANE project ([www.elianeproject.eu](http://www.elianeproject.eu)): a study that looked into the physical activity and dietary habits of French adults and adolescents versus certain characteristics of the environment in which these subjects lived.

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What elements in our living environment (the built environment) facilitate the practice of regular physical activity and a “healthy” life style?

Do differences in the socio-economical status affect the relationship between built environment, physical activity and being overweight?

Development of the ACTI-Cit es (active cities) project by the INCa (French National Cancer Institute), exploring the relations between the urban environment and gentle mobility.

### **A few reference documents**

- H. Charreire, C. Weber, B. Chaix, P. Salze, R. Casey, A. Banos, D. Badariotti, E. Kesse-Guyot, S. Hercberg, C. Simon, JM. Oppert. *Identifying built environmental patterns using cluster analysis and GIS - relationships with walking, cycling and body mass index in French adults. In revision*

- R. Casey, B. Chaix, C. Weber, B. Schweitzer, H. Charreire, P. Salze, D. Badariotti, A. Banos, JM. Oppert, C. Simon. *Spatial accessibility to sport facilities and food outlets and overweight in French youth. International Journal of Obesity, E pub, Available online 7 February 2012*

- H. Charreire, E. Kesse-Guyot, S. Bertrais, C. Simon, B. Chaix, C. Weber, M. Touvier, P. Galan, S. Hercberg, JM. Oppert. *Associations between dietary patterns, physical activity (leisure-time and occupational) and TV viewing in middle-aged French adults. British Journal of Nutrition 2011 Jan 21:1-8*

- H. Charreire, R. Casey, P. Salze, E. Kesse-Guyot, C. Simon, B. Chaix, A. Banos, D. Badariotti, M. Touvier, C. Weber, JM. Oppert. *Leisure-time physical activity and sedentary behaviour clusters and their associations with overweight in middle-aged French adults. International Journal of Obesity 2010;34:1293-301.*

- JM. Oppert, H. Charreire, C. Simon. *Activit e physique et sant e: remettre les enfants d’aujourd’hui en mouvement. Revue d’Epid miologie et de Sant e Publique 2010; 58:235-6.*



## Abnormalities of the cardiac system: new information, new images

→ **François Carré, Inserm unit 1099, signal and image processing laboratory, Rennes**

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- A prospective study of the differences in the cardiovascular systems of high-level French athletes. Preliminary data collected from 5000 high-level athletes concerning their electrocardiographic, ultrasound and treadmill test particularities versus sex, age and sport practiced, with a view to proposing "cardiovascular standards" for different types of sports.
- National project investigating the sudden-death phenomenon. The intensive practice of a sport may reveal unknown cardiopathies and induce the risk of a heart attack. In France, the estimated number of sudden deaths is estimated to be at least 1200. A hospital clinical research program currently collected French epidemiological data on the circumstances surrounding the causes of these accidents in subjects under the age of 35 years from all French coroners, emergency doctors and the Inserm teams involved in this problem in particular with a view to improving our knowledge of this real public health problem.

→ **Mathieu Pernot, team leader, Inserm unit 979 "Waves Physics for Medicine", Paris**

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- Ultra-rapid ultrasound scan imaging of the cardiac muscle and the striated muscle. Measurement of muscle elasticity and deformation.
- Potential use in sports medicine: Prevention of sudden death in athletes (early diagnosis of myocardic lesions), prevention of muscle trauma, enhanced characterization of muscle lesions to improve care, monitoring and follow-up of treatment.
- Presentation of the shear wave elastography method that allows us to quantify tissue stiffness (a biomechanical parameter vital to the muscle function) using a non-invasive, real-time ultrasound examination.

### **A few reference documents**

- *Real-Time Assessment of Myocardial Contractility Using Shear Wave Imaging, JACC*

- *Real-time visualization of muscle stiffness distribution with ultrasound shear wave imaging during muscle contraction. Muscle Nerve. 2010 Sep; 42(3):438-41.*