

# International cooperation to understand the child's developing and detect the troubles related to Cerebral Palsy.



The "PACE for CP" program – Perception Action Cognition Environment for Cerebral Palsy – represents an innovative and unique enterprise, carrying many hopes.

→ A child learns to adapt to his environment throughout his development. Psychomotor development is made possible by the interaction between perception, action (one's ability to impact on his environment) and cognition (the way one incorporates information from this interaction with his environment). Understanding how these three functions are connected should allow a better understanding of Cerebral Palsy, offering significant prospects of improvement, in terms of quality of life for the people impaired. This is what is at stake with the PACE program.

Recent discoveries in neurosciences demonstrate how important the interconnection between perceptive, cognitive and motor functions for motor and cerebral development is. How this integration happens, therefore, has to be understood.

These progresses in neurosciences also lead us to think that cognitive and perceptive disabilities play a bigger role than we used to think in Cerebral Palsy's mechanisms.

It seems more and more obvious that understanding the interactions between these three functions would make possible a better understanding of Cerebral Palsy, and bring significant prospects of improvement in dealing with this pathology and, therefore, in the lives of the impaired.

Even if traditional researches, studying each function separately, have generated many progresses, new integrated approaches that take into account the many aspects of the brain and its complexity should allow us to take a new step.



Pr Giovanni Cioni, scientific coordinator of the PACE program.



Emilie Gaillard, PhD, project manager of the PACE program at La Fondation Motrice.

Therefore, in order to promote this integrated and multidisciplinary approach and favour new studies, both scientific and clinical, that will bring significant progress for the impaired, La Fondation Motrice has initiated the PACE program. In this background, a **European network of excellence was created, coordinated by Pr Giovanni Cioni, neuropediatrician** at the Scientific Institute Stella Maris, University of Pisa (Italy). This network is brought together twice a year and makes a number of clinical research teams work together.



the "PACE for CP" program was initiated in 2010 by La Fondation Motrice with the support of its partner: the cooperative company Sodiaal, the most important in France for dairies

In 2011, the PACE program launched a **"pilot" study** to confirm the scientific accuracy of this new approach, and develop new tools of measurement and early screening for children with Cerebral Palsy:

- eye movement controls for the new born (Pr von Hofsten, Uppsala, Sweden)
- bimanual action (the child's ability to use both hands) (Pr Forssberg, Stockholm, Sweden)
- navigation (Pr Berthoz, Paris, France – see the opposite page)

A general review of the studies published on children's cognitive profiles is also undertaken by Dr Cans, Grenoble, France.

## Navigation study: a target for the PACE pilot study.



Walking disorders are very usual in young people with Cerebral Palsy. This can be explained not only by their motor deficit, but also by their cerebral deficiencies.

A life-size test, the "Magic Carpet", finally allows us to think of exploring this pathology. Explanations by Pr Alain Berthoz, honorary professor of the chair of physiology of perception and action at the College de France, member of the Academy of Sciences and the Academy of Technologies, and scientific coordinator, along with Pr Giovanni Cioni, of the pilot study within the PACE program.

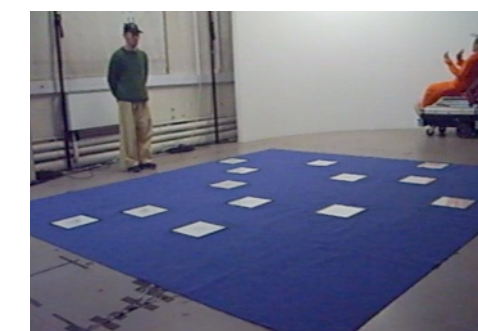
Thanks to the contributions of modern neurosciences, there are now many tests that assess deficiencies relating visuospatial cognition and walking. But most of these are either "paper tests", or virtual ones, which means the child, in fact, remains still.

**The Magic Carpet test**, based on the Corsi test (see below), was developed thanks to the work accomplished by Italian teams. Using electronically controlled luminous contacts, it allows the examiner to program any sequence of command ignition, and to note when the child is passing on these marks, using sensors.

Thus the child can be asked:

- to browse marks, following the shortest way
- to repeat a sequence
- to repeat this sequence from a different starting point
- etc.

This tool allows the observer to study non only visuomotor memory in a small space, but also locomotion following certain rules; what is studied are the cognitive functions used to switch spaces and points of view, and also the reference systems used by the child. Thanks to this new version, more able to reflect the complexity of everyday life's actions, it is now



possible to evaluate the necessary capacities in terms of daily movements that are not solicited in the test's classical version.

**The Magic Carpet is used by 5 laboratories across Europe: in Paris, Nice, Rome and Pisa.**

Today, the Magic Carpet raises the interest of a Danish foundation dedicated to Cerebral Palsy, with whom we have started working.

In the frame of the PACE program, a whole **international scientific multidisciplinary community** is developing using this new tool, bringing together clinicians, neurologists, neuropediatricians, psychiatrists, engineers, etc.

Several meetings bringing these teams together took place in 2011 and 2012 at the College de France.

### The Corsi test

A wood tray is used, in which nine cubes are arranged. The examiner successively singles out some cubes that he shows with the finger. Now the patient must repeat the sequence. To memorize and repeat it, he uses both visual locomotion and hand's locomotion.

Another version, the "walking Corsi", uses nine commands arranged in one room. The examiner walks successively on a number of commands, and the subject must repeat this sequence the same way. The exercise tests visuospatial memory, and also the capacity to generate locomotor trajectories.