Stars research team
Spatio-Temporal Activity Recognition Systems

Perception, cognition and interaction

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Engineers
Researchers
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National & international projects call

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Diagnosis, care and Memory centers network

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CoBTeK Cognition Behaviour Technology

ACTIVITY REPORT - 2012 – 2016

1. Presentation of the unit

In 2011, the Nice University Hospital Memory Centre (CMRR - CHU for **C**entre Mémoire de **R**essources et de **R**echerche **C**entre - **H**ospitalier **U**niversitaire de Nice) submitted a request for the creation of a University research unit. The aim was to promote the organization of a partnership between INRIA (for **I**nstitut **N**ational de la **R**echerche en **I**nformatique et **A**utomatique) and Nice Sophia Antipolis University. The founding units were the CMRR for the CHU and the STARS unit for INRIA.

The CoBTeK (Cognition – Behaviour Technology) unit (EA 7276) was created in January 2012.

Within the University of Nice Sophia Antipolis (UNS), CoBTeK is an « Equipe d'Accueil ». From the beginning the team is co-directed by a clinician (Pr Philippe Robert – UNS) and by an engineer (Dr François Bremond - Inria).

- At the French Riviera ComUE University (UCA – Université Côte d'azur), as it will be described in this document, CoBTeK already participates in larger project implementation in order to merge clinical, biological and technological fields (cf MNC3 project).
On the clinical side important points oriented the activities of the team:

- Because the director of the team is psychiatrist by training and chair of psychiatry at the Nice University, behavior, affect and cognition were the core clinical targets. The main clinical population concerned was that of elderly people (CMRR is devoted to Alzheimer's disease and related disorders). Early, the child psychiatry and adult psychiatry components joined the research team.
- Because the CMRR is clinically oriented, the team development focused on the promotion of interactions between care, education, research and cultural activities in the heart of the city of Nice. This scientific project allowed an optimal interrelationship between research, new technologies and human sciences by placing the patient and his caregivers at the center of interest.

The main localization of the CoBTeK unit is at the institute Claude Pompidou, but CoBTeK have 2 clinical additional sites; Valrose nursing home, the University Department of Child and Adolescent Psychiatry and Autism Ressources .

Basic technological developments were done directly at the INRIA in Sophia Antipolis in close relation with the Institut Claude Pompidou, where there are specific rooms for engineers (Appendix 3)

Scientific policy

The 2 mains objectives of CoBTeK were:

1/ To develop clinical and translational researches using ICT (**I**nformation and **C**ommunication **T**echnologies) in order to prevent, help to diagnose and assist patients suffering from neuropsychiatric and neurodevelopmental disorders.

In order to achieve this first objective, the team responded to several national and international research calls, but also developed several initiatives in order to interact with the environment (congress, general public meeting) and to promote research assistance and training (websites, senior training, familial and professional caregivers training). These different aspects are developed in section 2 (Achievements).

Due to the increasing participation of the other clinical partners coming from child psychiatry it became important to delineate as best as possible the interactions between clinical aspects and ICT. This lead to divide the activities in two related domains:

Monitoring and assessment:
The clinical goal was to design, test and use multiple sensors and techniques to assess cognitive, behavioural and activity of daily living functioning in patients, in order to have a better assessment and diagnosis.
Interventions to provide individualized care:
In this field the goal was to design and validate sensors and techniques than can help directly the patient and/or the caregiver in their daily life.

2/ To develop scientific networks between clinical teams of the CHU Nice, School of Medicine and the INRIA units.

One of the main characteristics of the CoBTeK team was to include in the same team experts coming from the medical fields (MD, psychologists, speech therapists) and from the ICT field (engineers). Merging such various sets of competence is of great interest. Usually research at the hospital aims to bring "fundamental biological research to the patient's bedside". The objective of CoBTeK was to guide this fundamental research as an "algorithm" at the living places of the patients. However, for most of the clinicians, research was only related to biological aspects. Therefore this second objective was to demonstrate the interest of the relation ICT – clinical aspects.

This has been developed, and led to the 'Digital medicine Brain Cognition and Behavior (MNC3[1])' letter of intent developed by CoBTeK and another INRIA team (Asclepios) under the hospice of the University Cote d'Azur (UCA) Idex Jedi presented in section 2.

This also led to the new scientific strategy and the proposed organization of the team for the next contract (section 4).

[1] http://www.innovation-alzheimer.fr/mnc3/

Activity profile

1/ Academic research (50 %):

- Included research activities such as responses to grant calls, design of protocols, submissions to ethical committees, conducting and monitoring research, publication of the project results and of recommendations. Another aspect was to balance as well as possible the grant submissions between several administrative entities (CHU Nice, UNS, Inria)

- Involved most particularly permanent clinicians/ researchers, students (masters, doc, post doc) and engineers.

2/ Interaction with environment (25 %):

- This is a very important aspect due to the localization of the research team, sharing space with the clinical team and therefore directly in relation with patients, professional and family caregivers. In addition the team developed collaborations with the city of Nice in order to deliver innovations program to the senior citizens.

- Involved most particularly permanent clinicians/researchers and clinicians of the memory centers (psychologists, speech therapists, nurses)

3/ Research assistance (15 %):

- This is directly in relation with the second objectives described in section 1 to develop scientific networks between clinical teams of the CHU Nice (psychiatry, neurology, geriatry, neurosurgery, oncology), and scientists at the INRIA units (Stars, Reve, Asclepios, Hephaistos, Athéna), at the University of Nice Sophia Antipolis (I3S, Lapcos), and CNRS (LEAT, IPMC).

- Involved most particularly permanent clinicians/researchers (PUPH) but also other MD of the clinical team.

4/ Research trainings (10 %): (other than regular teaching)

- These included the development of internships for engineers and researchers in order that they can observe the clinical practice. In addition, a specific internship program is in the process to start (September 2016) for the speech therapist students of the University of Nice (development done in the context of the modification of the teaching curse moving from 4 to 5 years – Master 2).

- Involved most particularly permanent clinicians/researchers (PUPH) but also other clinicians and students.

Organisation and life of the unit

1/ Structuration of the research unit:

The research unit is structured as indicated in the lower part of the figure presented in Appendix 4. At the moment of its creation, the CoBTeK was a small team and it seemed difficult to divide it in multiple sub-teams. However, taking into account the diversity of addressed clinical populations there are two main orientations, one for the elderly and adult population, and the other one for children. The linking factor between the two is the use of ICT.

Relations with Institutional guardianship must be seen in a triple perspective. First, within the team CoBTeK, an administrative cell was created by strengthening the interrelations with the cell on research and clinic innovation of the CHU. Two persons (V Marril & N Alexandre) were employed part-time with two funding (one from the UNS and the other by the CHU). The goals were to promote the joint response to the research call and to manage the finance of the research projects. Second, an administrative assistant (F Pasturaud) funded by research projects and the IA Association (Innovation Alzheimer) ensured the administrative management and equipment purchases. Third, the administrative assistance from the INRIA STAR team allowed, together with members of the team previously cited, the establishment of the necessary agreements for the acquisition and use of equipment.

2/ Work force

Team's size increases (due to research project, PhD students, relations with other groups, association IA). (cf also appendix 8 and RECH_1_4_UR_donnees_du_contrat_en_cours-21-12)

No recruitment within the university was realized. Two requests were done, one for a psychologist (but finally has been used by another UNS team in collaboration with CoBTeK), and the other for a teaching program (not accepted).

3/ Description of equipment and technological platform

As already indicated, the CoBTeK team works on several platforms. Localization as well as the equipments are summarized in Appendix 3. Most of the heavy equipment is located at the Institut Claude Pompidou. Another CoBTeK platform is located in a Nursing home - EHPAD Valrose - close to the University (cf appendix 3 map). Financing of the equipment came from multiple origins (Inria, CHU Nice with the CIU-s program, association innovation Alzheimer).

Serious games and assessments for the pediatric population are localized at the Autisme Ressources Center, Nice.

4/ Functional organizations

In practice the functioning was structured as follow:

- Monthly meetings of the overall team (organized in the different locations)

- Weekly research meetings specifically oriented to specific research project

- Dedicated teaching meetings for the students (master & PhD) (e.g., 180 seconds thesis presentation)

- The chart of the team is presented in Appendix 5.

Striking facts

1/ Basic research achievements

Among the most striking achievements for basic research (including Artificial Intelligence, Computer Vision) is the design of an automated system to recognize and quantify human behaviors. For this domain, three parts can be highlighted:

- The usability of the Activity Recognition (AR) System. The proposed system is used on a regular basis at ICP to complement the evaluation of older people when they are consulting the medical doctor at the CMRR. For instance, the doctor or clinician can receive in real-time the results of the older person at conducting various Activities of Daily Living (ADLs), such as preparing tea, performed in an ecological room at ICP. These results are summarized by the characteristics of the performed tasks (how long they take, how many times the patient is performing the tasks). This AR System has been validated on various benchmark datasets [IJCAI2015].

- The reliability of the Activity Recognition System. This system is able to run for several days at the nursing home at Valrose (before that the longest time that such system was able to run was a couple of hours). The system provides a summary of the ADLs performed by the residents in their room. Thanks to that, the medical coordinator has discovered some remaining functions (e.g. making her bed), that an Alzheimer resident was still able to conduct. A unique property of the AR System is to learn in an unsupervised way (i.e. limited user interaction) what are the main activities performed by the monitored people [AVSS2016]. This property is important to easily configure and install the system in various environments.
- The deployment of the Activity Recognition System. This system has been used for several trials in different countries (in Greece, France, and Sweden). It was able to combine various and heterogeneous sensors to improve the quality of the recognition [PAMI16]. This study has been published together with the proposed public benchmark datasets. This study shows what can be reproduced in different clinics, with different sensors and is particularly practical to design experimentation in a new location.

2/ Clinical research achievements / senior & adult population

The most striking achievement at the clinical level for the elderly population were:

- To conduct several studies for the assessment and for the stimulation of the patients and to translate these results to the everyday clinical practice and social environment (eg

assessment using speech recording or video sensor / development of the stimulation consultation)

- Some studies were also prevention oriented and lead to practical orientation for the general population. This includes studies directly conducted by the CoBTeK Team (Village project) or in partnership (MAPT, Multidomain Alzheimer Preventive trial, InMINDD FP7 project). The information of all the development and results of the studies done within the CoBTeK team were annually presented to the general public during the IA workshop.
- Appendix 7 summarizes the achievement done for social, economic and cultural stakeholders intended for social, economic and cultural stakeholders.

3/ Clinical research achievements in children and adolescent population

In addition to the classical clinical research of the group (cf appendix 6, 7 for epidemiological and pharmacological studies), the most striking achievement in the field of new technologies for the child and adolescent population were the development of serious games for autistic children

- for the training of emotion recognition of children with autism (JeStimule),
- for the teaching of reading competence to non-verbal autistic children (SEMA-TIC),
- for the training of emotion expression of children with autism (JEMImE -ANR)

4/ On a general point of view, one of the most significant achievements is related to the second objectives of the CoBTeK team (section 1), that is to develop scientific networks between clinical teams of the CHU Nice, School of Medicine and the INRIA units. This has been developed, and led to the 'Digital medicine Brain Cognition and Behavior (MNC3) letter of intent developed by CoBTeK and other INRIA teams under the hospice University Cote d'Azur (UCA) Idex Jedi.
MNC3 is a project of excellence in digital medicine for neurological and psychiatric diseases. This unifying project would, for the first time, jointly analyze neuroimaging data, behavior / cognition and biology / genomics for diagnosis and more effective care for patients. It would strengthen considerably collaboration between INRIA, UNS, CHU IPMC and create new links, new data and new research topics in the lead worldwide. This project involves major players on both FHU accredited by the University Hospital in 2015. 15 multidisciplinary teams support it. (cf also section 4).

2. Achievements

Scientific output

The research output can be described according to the monitoring/assessment and intervention section. The scientific publications are listed on appendix 6 [2] and the following paragraphs summarize the major output according to objectives described in section 1 (Scientific policy).

First it is important to remember that CoBTeK team have a strong experience in **classical clinical research** devoted to the diagnosis and treatment of behavioural /cognitive disorders in neuropsychiatry. Here are some outputs of the team during the period.

[2] Full references are listed chronologically in appendix 6

Diagnosis:

Gonfrier & al, 2012**:** Course of neuropsychiatric symptoms during a 4-year follow up in the REAL-FR cohort.

Ihl R & al, 2012: Detecting treatment effects with combinations of the ADAS-cog items in patients with mild and moderate Alzheimer's disease.

Abraham & al, 2013: Cerebrospinal Abeta11-x and 17-x levels as indicators of mild cognitive impairment and patients' stratification in Alzheimer's disease.

Kelaiditi & al, 2013: Cognitive frailty: rational and definition from an (I.A.N.A/I.A.G.G.) international consensus group.

Arbus C & al, 2014: Adjustment disorder with anxiety in old age : Comparing prevalence and clinical management in primary care and mental health care

Dubois & al, 2014: all.Advancing research diagnostic criteria for Alzheimer's disease : the IWG-2 criteria

Godefroy & al, 2014: Validation of an integrated method for determining cognitive ability : Implications for routine assessments and clinical trials.

Kenigsberg & al, 2015: Dementia beyond 2025 : Knowledge and uncertainties.

Manera & al, 2015: The Multilingual CID-5 : A new tool to study the perception of communicative interactions in different languages.

Okruszek & al, 2015: Impaired recognition of communicative interactions from biological motion in schizophrenia.

Semrau & al, 2015: Development of an international schedule for the assessment and staging of care for dementia.

Bonnard & al, 2015: Emotional Face Perception: Event-Related Potentials (ERPs) Contribution to Differentiate Schizophrenia and Autism Spectrum Disorders in Adolescents

Roussel & al, 2016: The Behavioral and Cognitive Executive Disorders of Stroke: The GREFEX Study.

Von der Luhe & al, 2016: Interpersonal predictive coding, not action perception, is impaired in autism.

Pardossi-Piquard& al, 2016: Influence of Genetic Background on Apathy-Like Behavior in Triple Transgenic AD Mice

Treatment:

Leone & al, 2012 Management of Apathy in Nursing Homes using a Teaching Program for Care Staff: The STIM – EHPAD Study*, International Journal of Geriatric Psychiatry*, 2012.

Fontaine & al, 2013 : Symptomatic treatment of memory decline in Alzheimer's disease by deep brain stimulation: a feasibility study.

Leone & al:, 2013 : Management of apathy in nursing homes using a teaching program for care staff: the STIM-EHPAD study

Amiéva & al, 2015 : Group and individul cognitive therapies in Alzheimer's disease : the ETNA3 randomized trial.

Bourgeois & al, 2015 : Relearning of activities of daily living: a comparison of the effectiveness of three learning methods in patients with dementia of the Alzheimer type.

Cummings & al, 2015: Apathy in neurodegenerative diseases : Recommendations on the design of clinical trials.
Menard & al, 2013 : Sécuriser la prescription des antipsychotiques en population pédiatrique : une étude multicentrique française en population naïve.

Raffin & al, 2014: Management of adverse effects of second generation antipsychotics in youth.

Jacquin-Piques & al, 2015 : Psychotropic Drug Prescription in Patients with Dementia: Nursing Home Residents Versus Patients Living at Home.

Serret & al, 2015: Lithium as a rescue therapy for regression and catatonia features in two SHANK3 patients with autism spectrum disorder

Vesperini & al, 2015 Prosocial intervention in children and adolescents with autism spectrum disorder without intellectual disability: benefits of videotaping therapy sessions.

Fernandez & al, 2015: Carbamazepine and psychotropic treatment interaction, about two cases of carbamazepine overdosage.

Starting from this experience and according to the first goal of the team scientific that is to develop **clinical and translational researches using ICT** the scientific output can also be divided in diagnosis and treatment fields.

1/ Diagnosis / Monitoring and assessment:

In the field of behavioral and cognitive disturbances it is important to develop better instruments for assessing disease severity and disease progression to optimize patient's care and support to care providers, and also provide better tools for clinical research. In this area, Information and Communication Technologies (ICT) are of particular interest. In order to develop these points CoBTeK initiated expert recommendations (Robert P.H& al, 2013: Recommendations for ICT use in Alzheimer's disease assessment: Monaco CTAD Expert Meeting).

In fact ICT may enable the patients 'performances and actions to be captured objectively and accurately evaluated in real time and real life situations.

The studies done within the different research project led to develop and test in clinical research ICT **sensors** that can be used at the Memory centre but also for some of them in the Nursing home or at the patient's home. Mains results underline the interest to use objectives sensors such as movement, video and audio sensors.

- **Movement's sensors** (actigraph) in order to assess subject activities and to correlate with behavioural characteristics such as apathy or sleep quality:
  - (David R & al, 2012: Decreased daytime motor activity associated with apathy in Alzheimer disease: an actigraphic study
  - Zeitzer & al, 2013: Phenotyping apathy in individuals with Alzheimer disease using functional principal component analysis.
  - Yakhia & al, 2014: Actigraphic Motor Activity in Mild Cognitive Impairment Patients Carrying Out Short Functional Activity Tasks: Comparison between Mild Cognitive Impairment with and without Depressive Symptoms.

- **Video sensors** (3D camera using an activity recognition algorithm) in order to assess directly the subject' performance when doing activities of daily living (eg preparing pill box, writing a check, answering the phone, preparing a tea). These types of sensors have been used not only at the memory consultations but also in Nursing home and in the patient's home.
  - Mulin & al, 2012: Functional dementia assessment using a video monitoring system: Proof of concept.
  - Romdhane & al, 2012: Automatic video monitoring system for assessment of Alzheimer's disease symptoms.
  - Sacco & al, 2012: Detection of activities of daily linving impairment in Alzheimer's disease and mild cognitive impairment using information and communication technology.
  - König & al, 2015: Validation of an automatic video monitoring system for the detection of Instrumental Activities of Daily Living in dementia patients
  - König & al, 2015: Ecological assessment of autonomy in instrumental activities of daily living in dementia patients by the means of an automatic video monitoring system.
  - Fosty & al, 2016: Accuracy and reliability of the RGB-D camera for measuring walking speed on a treadmill.

- **Video sensors** (3D cameras using an activity recognition algorithm) in order to assess directly cognitive performances when the subjects is playing a serious game
  - Manera & al, 2016: A Feasibility Study with Image-Based Rendered Virtual Reality in Patients with Mild Cognitive Impairment and Dementia.
  - Serret & al, 2016 (submitted): Teaching reading skills to minimally verbal school-aged children with autism spectrum disorders with a serious game.

- Hun & al, 2016 (submitted): Emotional Lexicon in Autism Spectrum Disorders: Impact of Emotion Recognition Training with a Serious Game.

- **Audio sensors** (microphone on smartphone, tablet or PC) in order to assess speech production during specific tasks and to correlate with cognitive performances
  - König & al, 2015: Automatic speech analysis for the assessment of patients with pre dementia and Alzheimer's disease).
  - König & al, 2016 (accepted): Use of Speech Analyses within a mobile application for the Assessment of cognitive impairment in elderly people

- ICT also include data analysis. At the public health level one of the task of the CoBTeK team is also to coordinate the analysis related to the data provided by clinical data basis. The most important is the **French national data basis (BNA)[3].** The BNA registers all medical acts performed by memory units and independent specialists throughout France. The BNA include data from more than 700 000 patients. This lead to several publications describing the MMSE (Mini-Mental State Examination) score upon initial diagnosis of Alzheimer's disease and related disorders among the French population; the positive predictive value of mild cognitive impairment (MCI); and the factors associated with progression in routine practice.
  - Tifratene & al, 2012: Use of drug treatments fo Alzheimer's disease in France : a study on a national level based on the Ntrional Alzheimer's Data Bank (Banque Nationale Alzheimer).
  - Anthony & al, 2014: The French National Alzheimer. Database: A Fast Growing Database for Researchers and Clinicians.
  - Pradier & al, 2014: The Mini Mental State Examination at the Time of Alzheimer's Disease and Related Disorders Diagnosis, According to Age, Education, Gender and Place of Residence: A Cross-Sectional Study among the French National Alzheimer Database
  - Tifratene & al, 2014: Mild cognitive impairment and anti-Alzheimer disease medications: A cross sectional study of the French National Alzheimer Databank (BNA)
  - Tifratene & al, 2015: Progression of mild cognitive impairment to dementia due to AD in clinical settings.
  - David & al, 2016 (accepted): Evolution of antidepressant prescription in Alzheimer's disease and related disorders between 2010 and 2014: results from the French National database on Alzheimer's disease

  The team also coordinates the French multicenter study ETAPE about adverse events in naïf pediatric patients during antipsychotic treatment, financed by French Medical Agency for Medicine and Health Product Safety (ANSM, 2012-2016).
  - Menard & al, 2013: Suivi thérapeutique d'un adolescent de 16 ans souffrant de schizophrénie précoce avec symptômes catatoniques.
  - Menard & al, 2014: Preliminary and ongoing French multicenter prospective naturalistic study of adverse events of antipsychotic treatment in naive children and adolescents.
  - Menard & al, 2015 (Preliminary and ongoing French multicenter prospective naturalistic study of adverse events of antipsychotic treatment in naive children and adolescents.
  - Menard & al, 2016: Incidence of adverse events in antipsychotic-naïve children and adolescents treated with antipsychotic drugs: a French multicenter naturalistic study protocol (ETAPE).

[3] http://www.innovation-alzheimer.fr/bna-en/

2/ Treatment / Interventions to provide individualized care:

In the senior population the studies done within the different research project[4] led to develop and test in clinical research **serious games (SG)** that can be used at the Memory centre but also for some of them in day care center, Nursing home or at the patient's home for patients with mild cognitive impairment or mild / moderate dementia. In the field field also CoBTeK initiated expert recommendations (Robert & al, 2014: Recommendations for the use of Serious Games in people with Alzheimer's Disease, related disorders and frailty).
The article systematically analyzed the Strengths, Weaknesses, Opportunities, and Threats of employing SG. The results revealed that SG might offer very useful tools for professionals involved in the care of patients suffering from Alzheimer's Disease and related disorders. However, more interdisciplinary work should be done in order to create SG specifically targeting these populations. Furthermore, in order to acquire more academic and professional credibility and acceptance, it will be necessary to invest more in research targeting efficacy and feasibility.
Here are some outputs of the team during the period:

- **SG for cognition & emotion:**

In the children population the different research projects led to the development of different serious games for autistic children, *JeStimule* for the training of emotion recognition, *SEMA-TIC* for the teaching of reading competence to non-verbal autistic children, and the ongoing project JEMImE for the emotional expression training. The serious games are used in the Autism Ressources Center, in Day care hospital, medico-social structures or at home.

  - Serret & al, 2014: Facing the challenge of teaching emotions to individuals with low- and high-functioning autism using a new serious game: a pilot study
  - Hun & al, 2016: Emotional Lexicon in Autism Spectrum Disorders: Impact of Emotion Recognition Training with a Serious Game.
  - Manera & al, 2015: Kitchen and cooking », a serious game for mild cognitive impairment and Alzheimer's disease : a pilote study.
  -

- Serious games (using 3D screen and sensors) in order to test the **feasibility of Virtual Reality solutions** in healthy elderly subjects and patients with mild cognitive impairment or mild / moderate dementia
  - Benoit & al, 2015: Is it possible to use highly realistic virtual reality in the elderly ? A feasibility study with image-based rendering.
  - Manera & al, 2016: A Feasibility Study with Image-Based Rendered Virtual Reality in Patients with Mild Cognitive Impairment and Dementia.

- Serious games (using PC and 3D camera with an activity recognition algorithm) in order to train **physical activities and cognition** in patients with mild cognitive impairment or mild / moderate dementia:
  - Ben-Sadoun & al, 2014:. Aerobic activity and environmental enrichment: Perspective for Alzheimer's patient.
  - Ben-Sadoun & al, 2016: Physical and Cognitive Stimulation Using an Exergame in Subjects with Normal Aging, Mild and Moderate Cognitive Impairment

- [4] FP7 Verve, Azgame, Village projects cf Appendix 7)

Academic appeal and reputation

1/ Scientific networks participation:

- CoBTeK coordinates with the Nice Memory center the BNA. In 2008, the third French National Plan for 'Alzheimer and Related Disorders' 2008–2012 was launched, having the following objectives: to strengthen the research on Alzheimer's disease (AD) and related disorders, to promote earlier diagnosis and to improve both patient management and support for careers. One specific part of this plan resulted in the creation in 2009 of the French National Alzheimer Database (BNA), aiming to provide epidemiological data as well as activity indicators. The information collected in the BNA consists of a limited set of data (CIMA for Corpus Information Minimum Alzheimer) concerning demographic, diagnostic and clinical details defined by national consensus. The number of variables is restricted to facilitate and enhance the participation in this national database. Participants are the French memory units [the memory centers (CMs: Consultations Mémoire) and the memory resource and research centers (CMRRs: Centres Mémoire de Ressources et de Recherche)] and independent specialists. In 2015 more than 500 send CIMA to the BNA. The plan neurodegenerative disease 2014 – 2019 aims to continue and amplify the BNA.
- CoBTeK have also other scientific partners (**IM2A** – Paris Pitié Salpetrière, **IPMC-** Sophia Antipolis, Stanford University- USA) and belong the European Alzheimer disease Consortium as well as the INTERDEM (Early detection and timely INTERvention in DEMentia) network devoted to non-pharmacological approaches to dementia-related conditions.
- CoBTeK also coordinates the French multicenter study ETAPE (2012-2016) with the participation of 10 University Departments of Child and Adolescent Psychiatry. Follow-up of adverse events during 12 months after instauration of antipsychotic treatment in naïf patients, 200 inclusions (79 in Nice). The child psychiatry section is also member of GDR3557 (CNRS, Institut de Psychiatrie)

Appendix 7 devoted to the contract does also provide information concerning the networks that extend to the biological and pharmacological domains.

2/ Involvements in national and International projects

- **National projects:**
  - AZ@GAME Alzheimer and Associated pathologies Game for Autonomy Maintenance Evaluation, Investissements d'Avenir Développement de l'Economie Numérique AAP e-santé n°1: Santé et autonomie sur le lieu de vie grâce au numérique : http://www.innovation-alzheimer.fr/azgame-en/
  - Village (implication des ateliers de prevention). Investissements d'Avenir Développement de l'Economie Numérique AAP e-santé n°2: Santé et autonomie sur le lieu de vie grâce au numérique : http://www.projet-village.fr/
  - ANR SafEE (Safe and Easy Environment for Alzheimer's disease) ANR – 13 – TECS – 0002 - 01 *http://www.innovation-alzheimer.fr/safee-en/*
  - Aidants & Eve CNSA (Caisse Nationale de Solidatité pour l'Autonomie) -appel à projets « Aide aux aidants 2015"
  - ETAPE (ANSM2012), « Evaluation de l'incidence des événements indésirables en population pédiatrique naïve traitée par antipsychotique au cours d'un suivi de 12 mois»
  - ANR-11-EMCO-0001 « Interaction émotion-cognition à travers l'étude du langage littéral et figuré dans les troubles schizophréniques et bipolaires: approche comportementale et électrophysiologique »,

- ANR-13-CORD-0004 « JEMImE. Jeu éducatif multimodal d'imitation émotionelle pour enfants atteints de trouble du spectre autistique. »
- PHRC-I 2011-2014 : « Evaluation de la prévalence de la schizophrénie chez l'enfant dans une population prise en charge dans des structures médico-sociales et sanitaires en PACA. »
- NeuroClin02 (2013-16) « A dose ranging Phase II Study in Children and Adolescents with Autism Spectrum Disorders to confirm efficacy of Bumetanide and to determine the optimal dose for phase III study"

- **International projects**
  - FP7: Dem@Care: http://www.demcare.eu/
  - FP7 VERVE: http://www.innovation-alzheimer.fr/projets-en/verve-en/
  - FP7 IN MINDD: http://www.inmindd.eu/
  - H20 20 SENS-Cog: Ears, Eyes and Mind: The 'SENSE-Cog Project' to improve mental well-being for elderly Europeans with sensory impairment.

3/ Prize and award:

- Victoire de l'innovation pour la function publique hospitaliére 2014 for EHPAD Panic a serious game developed with the AZ#GAME project
- Laureate of Malakoff Médéric Handicap Foundation 2016 for the development of software for the health care follow up of autistic children

4/ scientific events:

- Expert meeting organization during the IA workshop, 2013, 2014, 2015 aiming to provide recommendations for the use of ICT for the assessment and in clinical trials or for the recommendations for the use of Serious game in Alzheimer's disease and related disorders
- Organization of the International Society meeting of Gerontotechnology, Nice September 28 – 30 2016: http://www.isg2016.org/
- Organisation with CEA and LAPCOS (UNS) of the symposium « Innovative technologies and autism spectrum disorders », IACAPAP congress in July 2012 in Paris
- Organisation with MONAA of the symposium "Engineering and Computers to improve assessment and treatment of autism spectrum disorders" IACAPAP congress in August 2014 in Durban
- Annual Research Meeting of the University Child and Adolescent Psychiatry Department

Interaction with the social, economic and cultural environment,

1/ Partnership with socioeconomic stakeholders:

- Within the national and international projects CoBTeK developed partnerships with several companies: IBM, Philips, Genious, Idées-3Com (I3Com –Lille) - HLP Technologie - Paris - Solar Game - Nice

2/ Dissemination of scientific culture: general public events and web site

- Since 2014 the CMRR, the CoBTeK unit, the Alzheimer family association day care center, a Nursing Home and the association Innovation Alzheimer (IA, http://www.innovation-alzheimer.fr/homepage/) are located at the Institute Claude Pompidou (ICP). The main objective of the ICP is the promotion of interactions between care, education, research and

cultural activities in the heart of the city of Nice and also to place patients and caregivers at the center of interest.

- 1/ In collaboration with the family association Alzheimer 06 (belonging the France Alzheimer) the ethic group offers to patients, families and health professionals monthly meetings.
- 2/ Prevention: In collaboration with the association IA the CMRR develop for the City of Nice since 2012 Memory training group for the Nice citizens (more than 200 seniors participated each year).
- 3/ social interactions and non-pharmacological approach: In collaboration with the association IA the CMRR develops for the City of Nice since 2011 the CALMAN program aiming to organize museum and artistic visits for patients and families (between 10 to 12 visits per year) http://www.innovation-alzheimer.fr/calman-eng-2/ .Since the beginning of 2015, a website has also been launched in order to offer free cognitive trainings for patients suffering from memory and other cognitive problems http://www.memory-motivation.org/fr/jouer-2/?lang=fr

- On the child population side, CobTeK also provides:

  - Publications for general public and non-academic purposes: Book « Habiletés sociales, qualité de vie et autisme » published in 2010 (ISBN-13: 978-6131539589); Publication « Les modalités d'apprentissage dans l'Autisme " in the journal of the French Federation Sésame Autisme, 198, june 2016 ; web-site SMP
  - Annual or bi-annual days of CRA and numerous interventions during associations meetings, and organisation of « Asperger » café.
  - Collaborations with medical-social structures (IME, ITEP, …) of the PACA region (PHRC-I 2011). Without the collaboration with the different non-academic institutions, this type of research would not have been possible
  - Annual research days in child psychiatry with regular participation of non-academic public. In addition, organization of a general public seminar in 2013.
  - Participation (F Askenazy) in the transparency commission HAS 2014 about the antipsychotic aripiprazole for adolescents.
  - Scientific on-line monitoring for the association SFPEADA.

3. Involvement of the unit or team in training by research

Name of the doctoral school(s) concerned;

- ED 463 Sciences du Mouvement Humain
- EDSTIC: Ecole Doctorale des Sciences et Technologies de la Communication
- Science de Vie et Santé : ED 85

Master specialties

- Master speech therapy (training, supervision of students, teaching courses related to cognition behavior and new technologies)
- Master neuropsychology (teaching courses related to cognition and behavior)
- Master in Neuropsychology and developmental Psychology (supervision of students)
- Master in 'Recherche Sciences et Vie de la Santé' (supervision of students)

Participation in managing Master's degrees and doctoral schools;

- Direction of the Master speech therapy at the University of Nice Sophia Antipolis (UNS)
- Direction of the psychological and psychiatric teaching for the medical studies at the UNS (general education diploma in medical science / advanced training diploma in medical science / internship and psychiatry specialty)

Participation in national or international training networks

- STIM & TNM EHPAD training program for the nursing home staff with the ministry of health
- EDCON and ICHOM program for teaching behavioural and psychological symptoms of dementia

Theses defended in the period (n=5) and ongoing thesis (n = 12) are listed in appendix 6