Neuropsychological Trends

12
November 2012

LED
Edizioni Universitarie di Lettere Economia Diritto

Published in *Led on Line* - Electronic Archive by
LED - Edizioni Universitarie di Lettere Economia Diritto - Milano

http://www.ledonline.it/neuropsychologicaltrends/

ISSN 1970-321X

November 2012

E-mail

neuropsychologicaltrends@psychoneuronet.com

Neuropsychological Trends

The **Neuropsychological Trends** publishes original contributions to scientific knowledge in neuropsychology and neuroscience, and it provides an interdisciplinary forum on new trends on neuropsychology and psychophysiology. There is a growing dissatisfaction with fragmentation in theoretical perspectives on neuropsychology and without doubt there is a felt need for a journal containing articles which aim to integrate these fragmented ideas, theories and methods. We place particular emphasis on the fact that informed discussion of neuropsychology needs to be interdisciplinary.

The journal aims to introduce new ideas on the field of biological bases of behaviour and of the neurological perspectives applied to psychological processes. Specifically it intends to offer an ample space for innovative research methodologies and new theoretical views on the neuropsychological discipline. Methodological discussion will constitute a main topic of the journal. Specific attention will be given to the development of new theories and/or research methodologies applicable to group and single-case studies.

The journal is interested in basic and applied research and aims at opening up new avenues for the understanding, explaining, and treatment of neuropsychological issues. Specifically, **Neuropsychological Trends** will consider articles from any area of neuropsychological and neuroscience research, including, but not limited to: cognitive neuropsychology, clinical neuropsychology, neurophysiology, psychophysiology, and research techniques (fMRI; ERPs, PET).

The main topics proposed are:

- sensation and perception
- consciousness
- learning and memory
- communication and language
- motivation and emotion
- methodology of research (electroencephalography; brain imaging; behavioural measures)

With the financial support of the Catholic University of Sacreted Heart, Department of Psychology

Neuropsychological Trends

12
November 2012

SECTION I

XX Congresso Nazionale della Società Italiana di Psicofisiologia

Abstracts

SECTION II

2nd Global Congress for Qualitative Health Research

ENGAGING PEOPLE IN HEALTH PROMOTION & WELL BEING

New opportunities and challenges for qualitative research

Selected papers

Neuropsychological Trends

12
November 2012

IRCCS Fondazione Ospedale San Camillo

XX Congresso Nazionale
della Società Italiana di Psicofisiologia

Abstract

22-24 novembre 2012

IRCCS Fondazione Ospedale San Camillo
Venezia-Lido - Italy

http://www.sipf.it/

Program

Giovedì 22 novembre

9.30	Workshop: *Tecniche di neuronavigazione: uso del Softaxic*, a cura della Ditta EMS, Bologna
10.30-13.00	Simposio Satellite: *Neuromodulazione e riabilitazione dei distrurbi del linguaggio*
	Coordinatori: C. Semenza - F. Meneghello
	Stefano F. Cappa (Milano) *Il neuroimaging nella neuroriabilitazione del linguaggio*
	Carlo Miniussi (Brescia) *Linguaggio e deterioramento cognitivo: metodiche di stimolazione cerebrale non invasiva*
	Jenny Crinion (London, UK) *On-line tDCS in aphasia rehabilitation*
	Brigida Fierro (Palermo) *TMS e tDCS: metodiche alternative o complementari?*
13.00-14.00	Pausa pranzo
14.00-14.30	Apertura del Congresso
	Benvenuto e saluto delle Autorità Direttore Generale, dott. F. Pietrobon Direttore Scientifico, prof. L. Battistin
14.30-16.00	Simposio: *Dall'azione al linguaggio. evidenze neurofisiologiche su sistemi integrati*
	Coordinatori: M. Balconi - M. Bove
	Marco Bove (Genova) *Modulazione dell'interazione interemisferica in compiti di immaginazione motoria e osservazione dell'azione*
	Angela Bartolo (Lille, France) *Relazione tra gesto e linguaggio in neuropsicologia*
	Michela Balconi (Milano) *Modulazione TMS della risposta EEG/ERP nell'elaborazione di verbi di moto*
16.00-17.30	Simposio: *Meccanismi di promozione e regolazione della plasticità corticale*
	Coordinatori: F. Fattapposta - M.C. Pellicciari
	Maria Concetta Pellicciari (Brescia) *Regolazione omeostatica della plasticità indotta tramite stimolazione elettrica transcranica*

Angelo Quartarone (Catania)
Plasticità maladattiva in pazienti con disturbi motori

Nadia Bolognini (Milano)
Potenziamento della riabilitazione motoria con la stimolazione cerebrale non invasiva

17.30-17.45 Pausa caffè

17.45-18.45 Comunicazioni orali

Coordinatori: I. Magnano - P. Amodio

18.45-19.30 Lettura magistrale

Introduce: F. Piccione

Niels Birbaumer (Tübingen, Germany - Venezia)
Non-invasive learning in vulnerable brains using Brain-Computer-Interfaces

19.45 Cocktail di benvenuto

Venerdì 23 novembre

8.30-10.00 Simposio: *Psicofisiologia degli stati emozionali e sistema nervoso autonomo*

Coordinatori: M. Oliveri - A.M. Proverbio

Olga Pollatos (Potsdam, Germany)
Autonomic imbalance and facial recognition in somatoform disorders

Hugo Critchley (Brighton, UK)
Cingulate cortex and autonomic activity

Massimiliano Oliveri (Palermo)
Influence of TMS of the supplementary motor area on heart rate variability and sympathetic skin responses during processing of negative emotions

10.00-10.15 Pausa caffè

10.15-11.15 Comunicazioni orali

Coordinatori: A. Grippo - K. Priftis

11.15-12.00 Lettura magistrale

Introduce: L. Craighero

Hugues Duffau (Montpellier, France)
Awake surgery, brain networks and plasticity: present and future

12.00-14.00 Comunicazioni sessione poster

Coordinatori: C. Miniussi - S. Rossi

13.00-14.00 Pausa pranzo

14.00-15.30 Simposio giovani: *Interfaccia tra controllo esecutivo e comportamento automativo*

Coordinatori: M. Bortoletto - L. Cattaneo

Nicola De Pisapia (Trento)
Meccanismi prefrontali nell'elaborazione inconsapevole dell'informazione

Luigi Cattaneo (Trento)
Il ruolo della corteccia prefrontale nel controllo delle associazioni visuo-motorie automatiche

Marta Bortoletto (Brescia)
Effetti delle istruzioni sulle risposte automatiche durante l'osservazione dell'azione

15.30-17.00 Simposio: *Il dolore come esperienza "saliente": dalla "pain matrix" alla corteccia multisensoriale*

Coordinatori: M. de Tommaso - F. Brighina

Massimiliano Valeriani (Roma)
Dolore viscerale e risposta corticale

Gabriele Biella (Milano)
Modelli animali di elaborazione talamo-corticale nocicettiva

Giuseppe Cosentino (Palermo)
Meccanismi di plasticità omeostatica e dolore: evidenze da studi di stimolazione cerebrale non invasiva sull'emicrania

17.00-17.15 Pausa caffè

17.15-18.45 Simposio: *Psicofisiologia dei robot umanoidi*

Coordinatori: L. Fadiga - S. Rossi

Giorgio Metta (Genova)
iCub

Luciano Fadiga (Ferrara)
Innato vs acquisito

Domenico Prattichizzo (Siena)
Il controllo delle sinergie sensorimotorie della mano

18.45 Premio SIPF

Lettura magistrale

Gian Domenico Iannetti (London)
Patterns di risposta corticale allo stimolo doloroso

Assemblea dei soci

21.00 Cena sociale

Sabato 24 novembre

8.30-9.45	Comunicazioni orali
	Coordinatori: F. Sartucci - B. Rossi
9.45-11.20	Simposio: *La coscienza e i suoi confini*
	Coordinatori: M. Massimini - D. Perani
	Stanislas Deahene (Paris) *Signatures of consciousness*
	Lino Nobili (Milano) *The boundaries between wakefulness and sleep*
	Marcello Massimini (Milano) *Cortical mechanisms of loss of consciousness in health and disease*
11.20-11.30	Pausa caffè
11.30-12.45	Simposio: *Disturbi di coscienza: valutazione, meccanismi e riabilitazione*
	Coordinatori: F. Piccione - P. Manganotti
	Aldo Amantini (Firenze) *Valutazione e caratterizzazione neurofisiologica precoce del paziente con disturbo di coscienza*
	Aldo Ragazzoni (Firenze) *Il contributo della neurofisiologia clinica: acquisizioni e prospettive*
	Paolo Manganotti (Verona - Venezia) *Neuromodulazione e riabilitazione degli stati di minima coscienza*
12.45	Premio SIPF giovani ricercatori
14.00	Workshop su invito: *Indagini neurofisiologiche nei disturbi di coscienza*
	Moderatori: G. Galardi - W. Sannita

The role of neuroimaging in language rehabilitation

Cappa S.F.

Faculty of Psychology, University Vita-Salute San Raffaele, Milan, Italy

Functional magnetic resonance is the imaging technique that has been most extensively used to investigate the neural mechanisms of recovery of aphasia due to cerebrovascular lesions. The crucial need for longitudinal investigations of recovering patients adds a further layer of complexity to the difficult task of analyzing brain activation in cross-sectional studies of brain-damaged individuals. A dedicated workshop held at Northwestern University (Evanston, Illinois, USA) has adressed, by means of intensive discussion sessions among international experts in this research area, the main problems related to data analysis techniques. In particular, the discussion was focused on pre-processing, statistical analysis and interpretation of the results. While it was generally acknowledged that general procedures are difficult to apply to a wide array of diverse experimental paradigms, the workshop has generated a number of guidelines, which can be useful for investigators willing to enter this complex research field.

Cognitive deterioration, language and non-invasive brain stimulation

Miniussi C. [1, 2] **- Fertonani A.** [1] **- Manenti R.** [1] **- Cotelli M.** [1]

[1] *Cognitive Neuroscience Section, IRCCS Centro San Giovanni di Dio Fatebenefratelli, Brescia, Italy*

[2] *Department of Biomedical Sciences and Biotechnologies, National Institute of Neuroscience, University of Brescia, Brescia, Italy*

Recent studies have reported enhanced performance on specific cognitive tasks in patients with several types of neurological diseases (Alzheimer – AD, stroke) after receiving non-invasive brain stimulation (NIBS), i.e., repetitive transcranial magnetic stimulation (rTMS) or transcranial direct current stimulation (tDCS). Converging evidence has indicated that intermittent rTMS above 5 Hz (high frequency), which leads to increased neuronal firing, appears to have positive effects on behavior. Moreover it has also been shown that anodal tDCS can induce similar effects, increasing neuronal firing rates. Specifically, it has been showed by several experiments that rTMS reduces vocal reaction times for picture naming in normal young and old subjects and improves the number of correct responses in AD patients. Using tDCS, it has also been shown that anodal tDCS can ameliorate language performance in normal young and old subjects and deficits in AD e stroke patients. Studies have shown evidence of plastic changes in surviving neurons, even in severely affected areas. In AD patients, the NIBS-induced partial recovery of language abilities, may be due to a strengthening of the synaptic activity of the surviving neurons in the stimulated network. The same phenomenon can be observed in stroke patients after a lesion to an adjacent area or when connected areas become "silent" due to diaschisis and lesion-induced effects that result in silent synapses. NIBS might induce a gradual readjustment of an area that remains intact but "functionally" suppressed due to a steady reduction in synaptic strength. Therefore, these data support the idea that brain stimulation-induced changes in synaptic strength are an essential step toward the recovery of function. Indeed, improving the performance of a specific system within the functional network leads to more effective processing. Compensatory networks may be recruited or rebalanced to accomplish the impaired function. TMS or tDCS might induce a gradual readjustment of an intact but "functionally" suppressed area due to a steady reduction in synaptic strength. Therefore, these data supported the idea that brain stimulation-induced changes in synaptic strength are an essential step toward recovery of function. Therefore, NIBS could be used to strengthen or modify a network that is specific to a diminished cognitive function. Studies have suggested that the best way to perpetrate this strengthening is to stimulate the area and activate the network supporting the specific function. This approach can be achieved by combining exogenously induced plasticity (i.e., NIBS) with a specific training-induced plasticity (i.e., cognitive training). In part, this approach resembles the one used to improve motor performance in patients with hemiplegia.

If NIBS is applied when the system is in a given functional state, it will enhance and strengthen the specific distributed functional cortico-cortical (or subcortical) network that is active rather than inducing a non-specific arousal or activation of the system. The potential for inducing a slowing down of the cognitive decline or even a behavioural improvement in AD or Stroke patients, and the further possibility that these effects become long-lasting, are intriguing; and NIBS study's results could lead to the development of a new therapeutic approach.

Relationship between language and gestures in neuropsychology

Bartolo A.[1] **- Stieglitz Ham H.**[2] **- Dewaele J.**[1] **- Macchi L.**[1]
Boidein F.[3] **- Casalis S.**[1]

[1] *Université de Lille Nord de France, Lille, France*
[2] *St. Lucia, University of Queensland, Australia*
[3] *Hôpital St Vincent de Paul, Lille, France*

In cognitive neuropsychology, recent models of praxis processing have been mapped onto cognitive models of language processing, suggesting that gesture and language make use of parallel cognitive mechanisms. To better understand the relationship between gesture and language, two individuals with dyslexia, two with constructional dyspraxia and one child with both constructional dyspraxia and dyslexia were tested on a series of tasks assessing each mechanism of the cognitive models of language and gesture processing. The integrity of the lexical route for gesture and language processing was assessed using tasks measuring recognition (input lexicons) and identification (semantic systems) of gestures and words, gesture production and reading abilities (output lexicons). The sub-lexical route was tested using tasks assessing the imitation of meaningless gestures and the reading of pseudo-words. Furthermore, the unique dyspraxic pattern of an individual with Asperger syndrome will be discussed. Results showed that the two dyslexic children did not show any sign of limb dyspraxia. On the contrary, the two children with constructional dyspraxia demonstrated difficulties in language and gesture processing, both at the level of the lexical and sub-lexical routes. The child with dyslexia and constructional dyspraxia had difficulty in executing both meaningful and meaningless gestures as well as in reading words and pseudo-words. Since all the children showing limb dyspraxia had difficulties in reading abilities, it follows that some forms of dyslexia might derive from praxis deficits. This is in line with Corballis' evolutionary theory (2012), according to which language originated from manual gestures rather than animal vocal call. The relationship between gesture and language can be also elucidated in the praxic behaviour of JK, a child with Asperger syndrome who did not show difficulties in using objects or executing pantomimes. However, when asked to produce communicative gestures in response to social simulations presented in verbal or visual modalities, he provided an appropriate "verbal response only" without executing the corresponding gesture. Bernardis and Gentilucci (2006) reported that once individuals produce a gesture while simultaneously pronouncing the gesture name, there is interference at the expense of gesture, suggesting that words and gestures are coded as single signal by a unique communication system. JK's performance can be explained by assuming a deficit in this system and his results further confirm the relationship between language and gesture.

tDCS effect on N400 ERP in case of action or sentence representation

Balconi M.

Laboratory of Cognitive Psychology, Department of Psychology, Catholic University of Sacred Heart, Milan, Italy

In the present study, we explored the representation of an incongruent action (instrumentally incorrect use of an object) in comparison with sentences ending with an incongruent action word, taking into account the role of left dorsolateral prefrontal cortex (DLPFC) activation. This activity was appositely modulated by tDCS. The effect of tDCS when subjects processed congruent/incongruent object-related actions (Experiment 1) or sentences (Experiment 2) was verified by measuring changes in the ERP (event-related potential) N400, ERs (Error Rates) and RTs (Response Times). In Experiment 1, thirty subjects performed the detection task within a dynamic context (video tapes representing a sequence of four action frames). In Experiment 2, twenty-eight subjects read sentences that represented object-related actions. The stimulation effect (a cathode applied to the DLPFC and an anode to the right supraorbital region) was analysed by comparing the ER, RT and ERP profiles before and after stimulation (or sham treatment). As shown by ERP analysis and LORETA a significant reduction of the N400 was observed for incongruent stimuli in the case of cathodal stimulation of the DLPFC compared with pre-stimulation conditions for Experiment 1, but not Experiment 2. Moreover, ERs were increased, and RTs were reduced in response to incongruent conditions after tDCS, but not after sham stimulation in Experiment 1. It was suggested that perturbation of the DLPFC may limit the ability to analyse a semantically anomalous action sequence, with a reduced N400 ERP effect and increased random responses being observed. Finally, the contribution of the frontal area to the semantic processing of action was discussed, comparing action with sentence representation.

Homeostatic modulation of tDCS-dependent plasticity

Pellicciari M.C. [1] **- Bortoletto M.** [1] **- Miniussi C.** [1, 2]

[1] *Cognitive Neuroscience Section, IRCCS Centro San Giovanni di Dio Fatebenefratelli, Brescia, Italy*

[2] *Department of Clinical and Experimental Sciences, University of Brescia, Brescia, Italy*

Non invasive brain stimulation techniques have been shown to be able to induce synaptic plasticity. Two important mechanisms are involved in plasticity: gating mechanism, able to trigger the plasticity induction and homeostatic processes, able to guarantee stable level of synaptic activity over time. Recent studies have highlighted that applying transcranial direct current stimulation (tDCS) over primary motor cortex (M1) it is possible improve motor performance in healthy subjects and stroke patients. Aim of the study was to determine if combining tDCS with motor practice (MP) a task that enhances motor skills inducing cortical plasticity, affects motor cortical plasticity and learning in a polarity-dependent manner. To this purpose, we modulated M1 excitability by anodal, cathodal and sham tDCS in healthy subjects during a motor learning task. Thirty-six right-handed subjects took part in the experiment. The motor learning task consisted of a baseline block and six experimental blocks. Each block involved 40 fastest thumb abduction movements of the left hand, at a rate of 0.25 Hz. Visual feedback was provided during each trial, and subjects were asked to maximize the initial peak acceleration of the thumb, as measured by an accelerometer fixed to the distal phalanx of the thumb. tDCS was delivered at 1.5 mA current intensity (electrode surface 25 cm^2; current density 0.06 mA/cm^2) for 20 minutes on the right M1 during the execution of the six experimental blocks. The changes in motor performance, in terms of peak acceleration were evaluated. All data were normalized to the baseline block and analyzed with a 3 (stimulation) by 7 (block) ANOVA. The results show a general learning effect, as reported by a statistically significant increase in peak acceleration across time. Moreover, the data reveal that the learning rates varied between stimulation conditions. Post hoc analysis indicate a tDCS-dependent impairment in early phase of motor learning task in the anodal stimulation compared to sham, and an increase of the peak acceleration in the last two blocks of MP during cathodal compared to anodal stimulation. Planned ANOVA performed to separately contrast anodal condition to cathodal reported a general decrease of peak acceleration during anodal stimulation. In conclusion, the results highlight that neuronal plasticity induced in the motor cortex by tDCS is modified by concurrent motor learning task. Application of tDCS during an implicit motor learning task led to modulation of behaviour in a polarity specific manner. Anodal tDCS impairs performance during motor learning, highlighting that this current polarity combined with a motor task interferes with the gating effect.

Prefrontal mechanisms during unconscious information processing

De Pisapia N.

Department of Cognition and Education Sciences, University of Trento, Trento, Italy

The aim of this talk is to review the topic of unconscious processing in executive control. Executive control refers to the ability of the human brain – mostly associated with prefrontal cortex activity – to regulate the processing involved in the execution of novel or complex goal-directed tasks. Previous studies or models of human cognition have assumed that executive control necessarily requires conscious processing of information. This perspective is in line with common sense and personal introspection, which suggest that our choices are intentional and based on conscious stimuli. Nevertheless, in the last few years several behavioral and cognitive neuroscience studies have put under scrutiny this assumption. Cumulating evidence is now showing that prefrontal executive control can involve or be triggered by unconscious processing of information, with consequent effects on observed behaviors.

Motor mirroring meets motor performance

Cattaneo L. - Barchiesi G.

Center for Mind/Brain Sciences, University of Trento, Trento, Italy

Motor mirroring consists in the activation of one's motor system in response to, and congruent with, sensory inputs produced by another person's actions. In most social contexts of daily life however, the motor responses to others' acts are not imitative, but rather follow arbitrary rules. How is automatic mirroring and executive control of actions integrated? We investigated with transcranial magnetic stimulation (TMS) the timecourse of covert motor modulations in response to biological acts in different social tasks. We documented that in an early time window (varying between 150 and 250 ms according to the task) from stimulus presentation the observer's motor system resonates with the observed movements irrespective of the motor task to be accomplished. In a later time window (300 ms) the observer's motor system is modulated according to arbitrary responses. We speculate that the biphasic time-course of motor modulation reflects two distinct neural processes: an early automatic "mirror" activation and a later, arbitrary "executive" activation. In a second experiment we showed that the late modulation is not influenced by the duration of an associative visuo-motor training and is likely to be an all-or-none phenomenon linked to the arbitrary instruction rather than a product of neural plasticity. In a further experiment we targeted the dorsolateral prefrontal cortex with repetitive TMS experiment and showed an effect on the late component of the biphasic motor modulation. Finally in a last experiment we showed that early imitative automatic responses are necessarily present only if the observed actions and the arbitrary responses are the same, even though with an inverted response coding. However early responses disappear if the cue actions are not part of the response repertoire, thus showing that executive control can be variably efficient in controlling them.

Instruction-dependent effects on automatic responses to action observation

Bortoletto M. [1] **- Mattingley J.B.** [2] **- Cunnington R.** [2]

[1] *Cognitive Neuroscience Unit, IRCCS San Giovanni di Dio Fatebenefratelli, Brescia, Italy*

[2] *School of Psychology and Queensland Brain Institute, The University of Queensland, Queensland, Australia*

The relationship between perception and action is a key factor in unravelling the current debate over how we understand others' intentions, how we are able to imitate and how we select our actions in social contexts. Whereas traditional views considered perception and action as two independent systems working serially, recent neurophysiological and behavioral data have shown that the visual and motor systems are directly linked and inter-dependent. A crucial question is whether the link between perception and action can be regulated by higher cognitive processes to meet contingent demands. In this talk, three studies will be presented as evidence that the cognitive context in which actions are performed might influence visuomotor interactions. The first study supports that the visuomotor interaction is bidirectional so that action planning can influence action observation (motor-to-visual priming) and viceversa action observation can influence action planning (visual-tomotor priming). The second study supports that visuomotor interaction can be modulated top-down by higher cognitive functions, depending on whether own performed actions or observed actions are selectively attended. The third study shows that the effects of cognitive context on visuomotor interference are also dependent on the point-of-view of the observed action. Overall these data suggest that the interaction between the visual system and the motor system may be modulated by higher cognitive processes, so that when our own actions are more relevant to contingent demands, others' actions have much less interference on our behaviour.

Visceral pain and brain response

Valeriani M.

Division of Neurology, Ospedale Pediatrico Bambino Gesù, Rome, Italy
Center for Sensory-Motor Interaction, Aalborg University, Aalborg, Denmark

Mechanisms underlying visceral pain are far less known than those of somatic pain. Uncertainty concerns the anatomic pathways conveying the nociceptive inputs coming from internal organs to the brain and the cerebral areas constituting the "visceral pain matrix". The functional assessment of the visceral nociceptive system is mostly hampered by the difficulties in obtaining a sufficiently synchronized and reproducible input afferent to the brain. In the last ten years, the stimulation technique improvement has allowed researchers to record more and more reliable brain responses to gut stimulation. Balloon distension has been initially used to evoke pain to stimulation of different gastrointestinal tracts. Although this technique has the advantage to mimic the physiological stimulation, activation of the nociceptive endings may be asynchronous and irregular, so that the responses recorded from the brain have a poor signal/noise ratio. On the contrary, electrical stimulation of the gastrointestinal wall represents an un-ecological method which, however, allows us to obtain brain responses of reliable amplitude and morphology. By using this stimulation technique, it has been possible to record evoked potentials to stimulation of all tract of the gastrointestinal tube. The responses have been analyzed by dipolar modeling technique in order to disclose the cerebral areas involved in gut pain processing. Although the brain responses to heart stimulation cannot be recorded thus far, neurophysiological techniques of somatic pain assessment, such as the laser evoked potential recording, have been used to shed light on the physiopathology of cardiac pain. These studies showed that the central nervous system is involved in cardiac pain, mostly in cardiac syndrome X, characterized by normally patent coronary arteries.

Early neurophysiological assessment of the patients with disorder of consciousness

Amantini A.[1] - **Comanducci A.**[1] - **Spalletti M.**[1] - **Gori B.**[1]
Martinelli C.[1] - **Carrai R.**[1,2] - **Pinto F.**[1] - **Grippo A.**[1,2]

[1] *Unit of Clinical Neurophysiology, DAI Neurosciences, AOUCareggi, Florence, Italy*
[2] *UOF Riabilitazione Neurologica, Fondazione Don Carlo Gnocchi Onlus IRCCS, Florence, Italy*

While expert neurobehavioral observation remains the "gold standard" for the diagnostic assessment of patients with disorders of consciousness (DOC), neurophysiological investigations (electroencephalography, short latency evoked potentials and event-related potentials-ERPs) help to further understanding of the pathophysiology underlying the state of unresponsiveness, differentiate coma from other apparently similar conditions (i.e., locked-in and locked-in-like syndromes) and potentially integrate prognostic evaluation. Moreover, these techniques have the considerable advantage of being available at the bedside. Short latency EPs are indicators mainly of poor prognosis if absent, while ERPs are indicators of good outcome if present. However the sensitivity of the latter is low because they are identifiable in a minority of DOC patients, so their absence has not prognostic value. In order to add a new test between short latency and EPs and ERPs we studied the modulation of acoustic and somatosensory N100 during repetitive stimuli in patients with DOC. Using a simple passive paradigm with trains of stimuli short-term habituation (STH) can be detected; it is known as a fundamental component of attention as it represents a "bottom-up" filtering for salient stimuli and, at the same time, a prerequisite for subsequent "top-down" processing. We applied STH protocol in 30 DOC patients of different etiologies hospitalized in sub-intensive care units (emerging/high grade MCS/low grade MCS/VS, assessed with standardized neurobehavioral examination [Coma Recovery Scale - Revised, CRS-R]). STH were found in all emerging and high-grade MCS patients. An acoustic STH although sometimes atypical was also detected in every low-grade MCS. STH was absent in 50% VS (6/12) patients while it was someway preserved in the remaining 50% VS patients. Two among of the VS patients showing STH, subsequently became minimally conscious. Our protocol could be able to pick-up preserved elementary information processing in DOC patients since the early stages. Further outcome correlations are however needed in the VS group to assess a possible prognostic significance of STH detection. We all share the need to optimize the evaluation of patients with DOC and discontinuity between the hospital and rehabilitation phases is rightly considered to be one of the critical points. We think that an early neurophysiological characterization will enable to identify which paraclinical diagnostic or prognostic test is necessary, at any given time, for our routine assessment of individuals with DOC.

Separating transcranial direct current stimulation (tDCS) of Broca's area and speech therapy in chronic aphasia: a controlled outcome study

Volpato C. [1] **- Cavinato M.** [1] **- Piccione F.** [1]
Garzon M. [1] **- Meneghello F.** [1] **- Birbaumer N.** [1, 2]

[1] *IRCCS San Camillo, Venice, Italy*

[2] *Institute of Medical Psychology and Behavioiural Neurobiology, University of Tubingen, Tübingen, Germany*

Objective of this study is to assess the effect of transcranial direct current stimulation (tDCS) and speech therapy separated in time on language recovery in a sample of post-stroke chronic aphasic patients. Eight post-stroke patients with chronic aphasia were submitted to an *off-line* approach of treatment with tDCS on Broca's area and speech therapy. The patients were stimulated daily for two weeks with anodal tDCS (20-minutes, 2 mA) on Broca's area and two weeks with *sham* stimulation as control condition. The patients received also daily one-hour of individual speech therapy. The order of the two conditions and the treatment modalities (tDCS/*sham* and speech therapy) were counterbalanced. The effect of treatments on language recovery was measured assessing object and action naming abilities with a computerized picture naming task. Statistical analysis showed no difference between anodal tDCS or *sham* stimulation, both for objects and actions naming tasks. *Off-line* tDCS had no differential effect on nouns and verbs naming. The results of this study underline the role of simultaneity in time between tDCS and a particular task or positive treatment effect and may discourage clinicians to separate the two treatment modalities in time.

Brain stimulation over frontal area improves everyday life conversation in aphasic patients

Fiori V. [1] **- Zucchelli C.** [2] **- Di Paola M.** [1] **- Razzano C.** [1]
Calpagnano M.A. [1] **- Marini A.** [1, 3] **- Caltagirone C.** [1, 4] **- Marangolo P.** [1, 5]

[1] *IRCCS Fondazione Santa Lucia, Rome, Italy*
[2] *Faculty of Medicine and Psychology, University of Rome, Rome, Italy*
[3] *Faculty of Educational Sciences, University of Udine, Italy*
[4] *University Tor Vergata, Rome, Italy*
[5] *Faculty of Medicine, University Politecnica Marche, Ancona, Italy*

Recent studies have emphasized transcranial direct current stimulation (tDCS) efficacy coupled with language training to enhance lexical retrieval deficit in aphasic patients. However, improvements found in nouns or verbs naming does not always reflect significant changes in the participants' real-life, day to-day communication. In this study, we investigated tDCS efficacy in a more complex context of everyday life scenes to figure out whether spontaneous speech of eight cronic aphasics would improve after an intensive treatment based on "Conversational therapy". Nine short videoclips of everyday life contexts were prepared. Six videoclips were used to elicit spontaneous conversation in the patients during the treatment, while the remaining three were presented to the patients only before and after the therapy. Patients were required to describe each videoclip, with the help of a therapist, while they were treated with tDCS (20 min., 1mA) over the left hemisphere in three different conditions: anodic tDCS over the frontal areas, anodic tDCS over the temporal areas and sham stimulation. Each experimental condition was performed for ten consecutive daily sessions with 14 days of intersession interval. The linguistic analysis was carried out using a multi-level approach focusing on different aspects of the language process which were measured on the spontaneous conversation produced by each patient before and after each experimental condition. First, we run a "microanalysis" on the number of correct lexical elements (e.g. "thematic words" like nouns, verbs, adverbs, adjectives). Secondly, the number of grammatically correctly constructed phrases were considered. Finally, the number of semantically correct "Idea Units", which represent a chunk of information that have a communicative value, were analyzed. After frontal stimulation, patients showed a greater improvement in spontaneous speech in terms of verbs, "Idea Units" and correctly constructed grammatical phrases with respect to the other two conditions not only on the videoclips used during the treatment but also in the three contexts presented to the patients only at the beginning and at the end of the therapy sessions. These last results indicated a generalization of the recovery. Moreover, the follow-up testing revealed retention of the achieved improvement. Our data suggest that anodic tDCS applied over the left frontal area together with a intensive "Conversational Therapy" treatment might improve everyday life conversation in aphasic patients. We believe that positive treatment effect may be further enhanced and maintained by coupling language stimulation with anodic tDCS applied to the left language areas.

Mirror motor mapping of unseen actions: masked presentations of body actions affects cortico-spinal excitability

Mattiassi A. [1, 2] **- Mele S.** [1, 2] **- Urgesi C.** [1, 2]

[1] *Department of Human Sciences, University of Udine, Udine, Italy*

[2] *IRCCS E. Medea, San Vito al Tagliamento, Italy*

Several studies have shown that observation of actions performed by others induces a mirror-like activation in the observer's brain. Mirror motor activation seems to be triggered automatically independently of the explicit requirement of imitation and has also been found during observation of static postures implying actions. Whether mirror motor mapping of observed non emotional actions requires the perceptual awareness of the observer or is also present for subliminally presented actions, however, is unknown. Here we studied motor response to supraliminally and subliminally presented implied actions using a masked priming paradigm, with a sequential presentation of 3 pictures of different right hands: sample, masked prime and target stimuli. The sample stimuli was always static, while the prime and target stimuli could display a static hand, an index finger or a little finger abduction. The prime was presented for 53 ms and was forward and backward masked by a rotating masking stimulus. This masking procedure allowed us to present the prime for a relatively long time and, at the same time, to disrupt its explicit perception. Indeed, sixteen out of 20 subjects weren't able to correctly detect the prime hand in a follow up task. During the experimental task, a transcranial magnetic stimulation (TMS) pulse was delivered over the motor cortex 307 ms after the onset of the prime ("early") or 307 ms after the onset of the probe ("late"). Electromyography was used to record motor evoked potentials (MEPs) from the first digital interosseus (FDI) and abductor digiti minimi (ADM) muscles, which correspond to the driving muscle of the seen implied action. Results showed a mirror-like increase in corticospinal excitability following observation of supraliminally presented target hands (i.e., greater MEP amplitude during observation of the movement involving the recorded muscle as compared to observation of the static hand or of the other movement type). Crucially, a somatotopic response was also obtained after observation of an implied action prime, independently of the target hand implied action. In particular, the amplitude of FDI MEPs was lower during observation of little finger movements when compared to observation of index finger movements and of a static hands. This suggests a somatotopic inhibition of the cortico-spinal representation of a muscle in response to the subliminal presentation of an incongruent action. Thus, subliminal and conscious observation of implied actions yield opposite effects on cortico-spinal excitability, with inhibition for incongruent actions induced at a subliminal level and facilitation for congruent actions induced at a supraliminal level. Our results provide first time evidence that conscious perception of actions is not required for the mirror-like modulation of the activity within the observer's motor system.

Modulation of motor excitability induced by action observation in stroke patients

Marangon M. - Fedeli M. - Cavinato M. - Piccione F. - Tonin P.

IRCCS San Camillo Hospital, Venice, Italy

A substantial body of evidence indicates that primary motor cortex (M1) is part of a distributed cortical network that go well beyond simple motor production. One of the remarkable properties of M1 is its ability to respond to passive observation of motor acts as though the observer was actually performing the action. At motor cortex level, viewing another person's hand actions facilitates corticalspinal (CS) excitability in an onlooker's motor circuits. TMS-induced motor evoked potentials (MEPs) is a suitable technique used to assess corticalspinal (CS) excitability during action observation. TMS explorations in healthy participants have indicated that changes of corticospinal excitability during action observation are strictly time-locked and largely specific to the muscles involved in the observed action. Within this context, observation of healthy unimpaired motor performance may assist the recovery of hampered hand movements following stroke, simply by activating the affected cortical motor network in a similar way to that during movement execution and thereby enhancing plastic changes within this network. The present study point to better delineate the changes in corticospinal excitability that accompany perceptual to motor transformations when stroke patients are asked to observe an object-related action. We aimed at verifying if the observation of everyday movements made by the upper-limb produces muscle-specific and time-locked motor facilitation in hand muscles of stroke patients. Single pulse TMS was applied to ten right-handed stroke patients while they were watching video sequences containing right or left hand interactions with different size objects. We examined the MEPs modulation of the muscle involved in the observed actions (first dorsal interosseous (FDI)) and (abductor digiti minimi – ADM). MEPs were also recorded at rest at the beginning and at the end of the video sequences to establish baseline values. We found that motor cortex excitability, in patients with right hemisphere damage (RHD), appears to be modulated by the hand movements observed and that object-size MEPs were muscle specifics to the kinematics characterizing observed actions. Conversely, in patients with left hemisphere damage (LHD), we didn't detect any time-locked or muscle specific modulation in CS excitability. Our findings suggest that the specificity of the motor program activated via action observation depends on the phase of the observed movement and it is reflected in CS excitability. This study attempted to identify crucial factors that could increase motor function by helping to regain or maintain a normal cortical representation of the body in order to improve motor rehabilitation outcomes.

McGurk effects require a motor coding

D'Ausilio A. [1] **- Bartoli E.** [1] **- Maffongelli L.** [1] **- Berry J.** [1] **- Fadiga L.** [1, 2]

[1] *IIT - Istituto Italiano di Tecnologia, RBCS - Robotics, Brain and Cognitive Sciences Department, Genova, Italy*

[2] *Università di Ferrara, DSBTA, Dipartimento di Fisiologia Umana, Ferrara, Italy*

In speech perception auditory and visual information related to lips movements are coupled to probably improve speech recognition in noisy environments. Mismatching auditory and visual information lead to the McGurk illusion. However, in natural conditions, only a relatively small part of the speech-related visual signal is available because most articulators, such as the tongue, are not visible. Thus, visually showing articulators for which we have no visual experience should not induce perceptual auditory-visual integration, unless more complex mechanisms involving observer's/listener's sensorimotor representations are at the basis of the McGurk effect. Starting from these considerations, we investigated whether visually presented tongue movements, not normally visible in a speaker, elicit a McGurk-like effect. Short video clips showing the sagittal profile of a tongue (ultrasound images) articulating different syllables (ba/ga/pa/ka) were aligned to the sound (ba/pa). The three conditions we investigated were: Matching audio-video stimuli, Mismatching stimuli, and Control condition (visual stimuli formed by scrambled videos). 15 right-handed subjects participated in the study. Subjects had to attend the stimuli and were asked to perform a 2 alternative forced-choice task (two buttons associated to the auditory "ba" or "pa" syllables). Reaction times (RTs) of the three conditions significantly differ from each other. In particular, RTs in the Mismatching condition are slower than the Matching one and faster than Control. The shorter RTs for the identification of the syllable during the Match and Mismatch conditions with respect to the Control demonstrate that tongue-related information have been processed offering a general speeding advantage. This may be interpreted as a larger implicit salience of biologically moving stimuli. However, the difference between Match and Mismatch supports the idea that specific, visually presented, tongue movements are implicitly recognized by the subject, since their congruence with auditory information leads to a further speed advantage. This result offers important implications for the interpretation of the classical McGurk effect as well as of the role of prior motor knowledge for the classification of perceived speech. In fact, the classical interpretation of the McGurk illusion is based on the functional disagreement between two sensory modalities and is considered to take place in multisensory integration areas such as the superior temporal sulcus. However, other lines of research have proposed that both auditory and visual information are first translated into motor codes, suggesting that McGurk-like effects are originated by mismatch in sensorimotor coordinates. Our results support this second view by demonstrating that the audio-visual speech classification may also be mediated by the somatomotor system.

The role of the primary motor cortex on action-verbs comprehension: a rTMS study

Repetto C. [1] **- Colombo B.** [1] **- Cipresso P.** [2] **- Riva C.** [1]

[1] *Department of Psychology, Catholic University of Sacred Heart, Milan, Italy*

[2] *Applied Techonology for Neuropsychology lab, Istituto Auxologico Italiano, Milan, Italy*

According to Embodied Cognition theory, neural systems deputed to perception and action are also involved in language comprehension, to the extent that conceptual knowledge is mapped within the sensory-motor system. Several researches demonstrated that verbs referring to actions performed with different body parts trigger the same cortical regions activated during the real action. The aim of the present study is to investigate the role of the primary motor cortex (M1) during action-verbs processing. The main hypothesis is that if M1 is necessary for semantic processing of action verbs, than applying rTMS over the portion of M1 that controls hand movements, should allow to detect a modulation of reaction times for verbs describing an action performed with the hand; on the other hand, this changes are not exptected working with abstract verbs. Twenty-four hand-action verbs (e.g to sign) and twenty-four abstract verbs (e.g. to imagine) have been selected and matched for number of letters, numbers of syllables and frequency. We recruited twenty university students who volunteered to join the study; they were all native italian speakers and strongly right-handed. The participants completed a semantic judjment task, in which they had to press one of the 2 allowed keys to indicate wheter the verb was concrete or abstract. Reaction times were recorded. The task was performed before and after an offline session of low frequency (1 Hz) rTMS delivered over the hand portion of the right and left M1. The results indicate that, as a general trend, participants are faster when answering after the right stimulation compared to the left stimulation, and (not surprisingly) when answering to concrete verbs, if compared to abstract verbs. The most interesting finding is the significant interaction between the side of stimulation and the type of verb: data suggeste that RTs for concrete verbs after left stimulation are significantly slower than for concrete verbs after right stimulation, as well than for abstract verb after left stimulation; these results seem to underline a specific effect of left stimulation towards concrete verbs. The goal of the experiment was to address the "necessity question" about the involvement of M1 during language processes. The main result of the research is that the stimulation affected selectively the processing of action verbs and not of abstract verbs, and that this effect is specific for the left primary motor cortex. This laterality effect seems to confirm that the understanding of action-verbs entails motor programs: actually the controlateral motor area is involved only in right-handers, in both action execution and comprehension. In conclusion, the present findings support the hypothesis that the primary motor cortex is functionally involved in semantic action-verb comprehension, and coherently with handedness.

TDCS-induced naming facilitation in healthy-aging subjects: the importance of timing

Fertonani A.[1] **- Brambilla M.**[1] **- Cotelli M.**[1] **- Miniussi C.**[1, 2]

[1] *IRCCS Centro San Giovanni di Dio Fatebenefratelli, Brescia, Italy*

[2] *Department of Biomedical Sciences and Biotechnology, Faculty of Medicine, University of Brescia, Brescia, Italy*

Actions or objects naming is a complex ability, that requires the involvement of a wide cerebral network that comprise, among other areas, the left prefrontal and temporal areas. In particular the crucial role of the left dorsolateral prefrontal cortex (DLPFC) in action naming has been previously confirmed by repetitive transcranial magnetic stimulation (rTMS) studies. Transcranial direct current stimulation (tDCS) is a technique, able to generate a long-term increase or decrease in the neuronal excitability that can modulate the performance in cognitive tasks, similar to rTMS. The aim of this study was to explore the effects of anodal tDCS on a picture naming task in healthy-aging subjects. In particular we were interested to understand which was the best timing to apply stimulation (during vs. before the task execution) to obtain the greatest facilitation effect. The stimulation was delivered by a battery-driven, constant current stimulator through a pair of saline-soaked sponge electrodes (7×5 cm). The picture naming task was made up of three experimental blocks and a practice block. Each block included 14 object and 14 action images. The subjects were required to accurately name, as fast as possible, the stimuli appearing on the computer screen. Anodal tDCS was applied to the left DLPFC before or during the execution of a picture naming task in 20 healthy-aging subjects (10 males, mean age 66.5 years).The results were compared to that obtained in a placebo condition. We measured the percentage of accuracy and the latency of the verbal reaction time (vRT) of each subject in each condition. Anodal tDCS applied during the task on the left DLPFC improves naming performance, faster vRT ($p < 0.05$), whereas anodal stimulation applied before the task has not statistically significant effects. Recent papers suggests that timing could be a key variable in influencing the effects of tDCS. This study confirm that the state of cerebral activation during the stimulation influences significantly the obtained behavioral results. Based on the Hebbian theoretical hypothesis, from previous and present observations in the neurostimulation fields, we assume that the capacity of the cerebral network, dedicated to lexical retrieval processing, to increase its efficiency is maximized only if anodal left DLPFC tDCS is applied on an "active" neural network. This datum seems in contrast with our previous study on young subjects, in which we observed a facilitation in an offline condition (i.e., stimulation before the task). The absence of offline facilitation could probably be due to the different responsiveness to tDCS of healthy-aging neural networks. Based on our results, in older adults the cerebral network dedicated to lexical retrieval processing may be facilitated only if tDCS is applied on an "active" neural network.

Can Managers compete to increase their vagal tone?

Palomba D. [1] **- Munafò M.** [2] **- Stegagno L.** [1]

[1] *Department of General Psychology, University of Padua, Padua, Italy*

[2] *Mind-Room Lab SRL, Vicenza, Italy*

Many studies showed how competition contributes positively to achievement by enhancing intrinsic motivation and fostering the mastery of a skill. However, competition also represents a considerable source of social pressure, that can elicit heightened sympathetic or decreased parasympathetic cardiac modulation, thus impairing autonomic balance and flexibility and potentially enhancing the risk of cardiovascular diseases. Given the impact of competition on physiological arousal, it is not surprising that many studies have reported using bio-behavioral techniques, such as biofeedback, to reduce sympathetic activation produced by competition. However, only few studies have tried to exploit competition itself as motivation factor for challenging individuals to reduce their physiological arousal. The present study investigated whether a competitive biofeedback (BF) training can be used with high competitive Managers in order to increase their respiratory sinus arrhythmia (RSA), an index of cardiac vagal control. Thirty-one Managers, leading outstanding private or public Companies, were randomly assigned to either a Non-competitive (n = 17) or Competitive RSA-BF group (n = 14). Participants in the latter group had to compete with paired competitors on their ability to increase RSA. All participants underwent five 40 min RSA-BF sessions. The outcome was assessed as changes in RSA, heart rate (HR), blood pressure (BP) and skin conductance level (SCL) from pre- to post-training. After BF-training, an increase in resting RSA was observed in the Competitive group only. A significant decrease in resting HR, SCL and systolic blood pressure (SBP) was observed after the training in both groups. Results showed that competition can be used with Managers involved in high-level work responsibilities, in order to enhance their cardiac vagal control. Moreover, competitive BF, while enhancing Managers' RSA, did not prevent BF-assisted acquisition of reduced general arousal.

Association between depressive symptoms and reduced cardiac vagal modulation in patients after cardiac surgery

Messerotti Benvenuti S. [1] **- Patron E.** [1] **- Favretto G.** [2]
Gasparotto R [2] **- Palomba D.** [1]

[1] *Department of General Psychology, University of Padua, Padua, Italy*

[2] *Unità Operativa di Cardiologia Preventiva e Riabilitativa, Ospedale Riabilitativo di Alta Specializzazione di Motta di Livenza, Treviso, Italy*

Several lines of evidence indicate that depression is a relevant and independent risk factor for cardiovascular diseases. Reduced heart rate variability (HRV), which reflects altered autonomic nervous system activity, has been suggested as a potential factor linking depression to cardiovascular diseases. While several studies have investigated the association between depression and reduced HRV in patients with cardiovascular diseases, to our knowledge, this relationship has not yet been studied in patients after cardiac surgery. Therefore, the main aim of this study was to examine whether postoperative depressive symptoms could be related to reduced HRV. Patients with depression and without depression, who had undergone cardiac surgery, were enrolled postoperatively. In all patients, HRV was derived from a four-minute blood volume pulse recording at rest. Analyses of covariance and partial correlations, while controlling for anxiety, were used to examine the association between postoperative depression and HRV parameters. The two groups of patients (i.e., with depression and without depression) were comparable in terms of demographic, biomedical and surgical characteristics. Compared to non-depressed patients, patients with depression showed significantly lower standard deviation of N-to-N intervals (SDNN), root mean square successive difference of N-to-N intervals (rMSSD), and high frequency power. Partial correlation analyses showed that depression was inversely related to SDNN, rMSSD, and high-frequency power, whereas it was unrelated to other HRV parameters. Discussion: These novel findings add to the literature on physiological mechanisms underlying the association between depression and cardiovascular disease by showing that a depression-reduced HRV relationship extends to patients after cardiac surgery. Also, our study suggests that postoperative depression is more likely to be associated with reduced cardiac vagal modulation rather than excessive sympathetic influence. Conclusion: Reduced HRV, especially an altered vagal tone, may be considered as a potential mechanism underlying the link between postoperative depression and subsequent risk for cardiac events or mortality after surgery. In particular, the present study suggests that, in addition to cardiac surgery itself, depressive symptoms may further affect HRV in the early postoperative period, potentially contributing to adverse outcome in patients after surgery.

Cerebral vasomotor reactivity modulate by tDCS: could be a fast-track for stroke patients?

Sartucci F. [1, 4] **- Briscese L.** [1] **- Tognazzi S.** [1] **- Naraci M.** [1] **- Bocci T.** [1, 2]
Traverso E. [3] **- Del Sette M.** [3] **- Orlandi G.** [1] **- Giorli E.** [1, 2]

[1] *Department of Neuroscience, Unit of Neurology, Pisa University Medical School, Pisa, Italy*

[2] *Department of Neuroscience, Neurology and Clinical Neurophysiology Section, University of Siena, Siena, Italy*

[3] *Unit of Neurology, Sant' Andrea Hospital, La Spezia, Italy*

[4] *Department of Neuroscience, Cisanello Neurology Unit, University Medical School, Pisa, Italy*

Cerebral vasomotor reactivity (VMR) is the capability of cerebral vessels to change their diameter in response to hypercapnia. One of the techniques to evaluate VMR is the "breath-holding" test. It can be quantified as the percentage increase in flow velocity (PIV) weighted by the time the breath is held (Breath-Holding Index or BHI: PIV / period of breath holding in seconds). In order to minimise haemodynamic changes following deep inspiration the patients should hold their breath at the end of a normal inspiration. Transcranial direct current stimulation (tDCS) can modulate brain function through a focal and prolonged cortical polarization shift. Anodal tDCS (A-tDCS) on primary motor cortex (M1) increases its excitability, whereas cathodal (C-tDCS) produces opposite effects. tDCS effects on cerebral haemodynamic have been poorly studied. In our study we evaluate the change of VMR on 11 healty subjects before and after tDCS stimulation. Eleven healthy subjects underwent anodal/cathodal tDCS (8 female and 3 male, 21-50 years; 5 A-tDCS vs. 6 C-tDCS) on right M1. Before and after tDCS, VMR assessment by transcranial ecocolordoppler (evaluating right middle cerebral artery (MCA) by transtemporal approach) and heart rate variability (HRV) were measured. Normalized low-frequency (LFN) band power of heart rate variability and its reactivity from basal to VMR condition (LFNreact) were estimated as markers of sympathetic activation. We found that tDCS exerted a specific effect on both VMR and HRV. In fact, A-tDCS decreased VMR (Mean BHI 1.12 before tDCS and 0.72 after A-tDCS) increased LFN react, whereas C-tDCS increased VMR (Mean BHI 0.721 before tDCS and 1.32 after C-tDCS) and reduced LFNreact. VMR and HRV are modified by tDCS. The changes of HRV can suggest the modulation of VMR by the sympathetic nervous system. Further studies are needed to confirm this hypothesis, that can support the clinical use of tDCS in order to modulate VMR in stroke patients.

"The more I wait the more I process": a high-density event-related study on the automatic expectancy-related brain activity

Mento G. - Tarantino V. - Sarlo M. - Bisiacchi P.S.

Department of General Psychology, University of Padua, Padua, Italy

Neuroimaging studies have shown that implicit temporal expectation is represented within cortical areas traditionally associated with action programming and motor preparation, such as pre-motor areas or inferior parietal cortices. However, recent data showed other cortical regions not strictly associated to motor processing, such as the right dorsolateral prefrontal cortex (r-DLPFC), to be also selectively engaged in temporally predicable tasks requiring speeded motor responses, like for example, the variable foreperiod paradigm. Thus, it still remains unclear whether motor preparation/execution and response selection are necessarily implicated in implicit temporal expectation. The aim of the present study was to unravel the contribution of task-related processing (response selection and execution) on the stimulus expectancy-related brain activity. High-density EEG (128 sensors) was recorded in eighteen young adults during a passive interval timing task consisting in the passive viewing of pairs of visual stimuli (S1 and S2) interspersed with empty intervals (ISI). In the standard condition (70% of trials), the ISI lasted 1.500 ms, while in the two alternative, deviant conditions (15% each), it lasted 2.500 and 3.000 ms. The main purpose was to create an implicit temporal rule based on the maximum expectation of a determinate event (S2 onset) in a precise time-point, that is 1500 ms after S1 offset.We expected that when this rule was violated (i.e., in the two low-probability deviant conditions), an up-dating of the conditional probability of S2 occurrence would be automatically engaged in order to allow attentional resources to be re-oriented over time, this mechanism being reflected in a modulation of the S2-locked ERP activity. We found a significant amplitude modulation of the P2 response over the fronto-central right scalp area that was directly proportional to the ISI. In particular, the more subjects passively expected S2, the larger was the P2. Brain source analysis performed with the Brainstorm toolbox localized this effect in the right dorsolateral prefrontal cortex (rDLPFC; Broadmann Area 9/46). The ISI-related proportional modulation of the P2 response elicited by S2 onset accounts for the existence of an automatic temporal monitoring mechanism sensitive to the conditional probability of event occurrence. This mechanism seems to be automatically prompted by statistically constrained temporal structures and consists in the progressively shifting of attentional resources over time in order to unconsciously prepare and anticipate events. When events cannot be predicted according to fixed or informative pre-orienting cues, temporal expectation is automatically updated as a function of the change of signal occurrence conditional probabilities over time. The rDLPFC plays a key role in this process.

ERPs and cerebral perfusion correlates in Mild Cognitive Impairment (MCI)

Magnano I. [3] **- Nuvoli S.** [1] **- Cabboi M.P.** [3] **- Sanna G.** [3]
Cherchi R. [3] **- Piu R.** [3] **- Solinas G.** [2] **- Piras M.R.** [3]

[1] *Unit of Nuclear Medicine, Department of Clinical and Experimental Medicine, University of Sassari, Sassari, Italy*

[2] *Department of Biomedical Sciences, University of Sassari, Sassari, Italy*

[3] *Unit of Clinical Neurology, Neurophysiopathology Lab*

Objective of this study was to find ERP and cerebral perfusion correlates of cognitive impairment in MCI patients. Ten patients (age 66.5 ± 5.1; 6 women) underwent ERP recordings (N400 and P300) by means of 30 electrodes and 99 mTc HMPAO SPECT. A selective neuropsychological battery was administered to assess general cognitive status, short- and long-term verbal memory, episodic memory, constructional praxia. Abnormal N400 (decreased amplitude or absent) was found in 8/10 of MCI patients. As a group, no significant differences between the N400 amplitude to *incongruous* words and *congruous* words were recorded in MCI patients with respect to the controls. No significant correlations were observed between N400 amplitude with age and depression. P300 was normal in 8/10 of patients. In comparison with controls, 9 out 1 patients showed significant hypoperfusion in the frontal, limbic and temporal lobes mainly on the left side. Neuropsychological assessment disclosed a slight involvement on tests exploring verbal and episodic memory in 8/10 of patients. Statistical analyses revealed significant correlations between N400 abnormalities and left frontal lobe SPECT hypoperfusion ($p = 0.04$ $r = 0.7$), verbal memory score ($p = 0.02$ $r = 0.75$) and verbal learning test ($p = 0.03$ $r = 0.6$). Also, left temporal lobe deficit perfusion correlated significantly with verbal memory test patients' performance (($p = 0.04$ $r = 0.6$). N400 abnormalities and cerebral perfusion findings described in this study enable the detection of neuropathological dysfunctions in MCI providing functional informations. Both electrophysiological recordings and SPECT neuroimaging may support neuropsychological evaluation in identify earlier functional biomarkers of cognitive deficits in MCI and even in subjective cognitive impairment (SCI). Such functional correlates could provide useful tools in predicting conversion to dementia.

Covert visuospatial attention-based BCI for ALS patients

Marchetti M. [1] **- Piccione F.** [2] **- Silvoni S.** [2] **- Priftis K.** [1, 2]

[1] *Department of General Psychology, University of Padua, Padua, Italy*

[2] *IRCCS San Camillo Hospital, Lido-Venice, Italy*

By translating brain signals into commands, brain-computer interfaces (BCIs) allow people to control devices. BCIs represent a concrete solution for the communication problems of patients with amyotrophic lateral sclerosis (ALS). Most of the BCIs rely on visual interfaces, in which patients must move their eyes in order to reach efficient BCI control. This fact represents a limit of BCI use with ALS patients who are in the latest stages of the disease (i.e., locked in state [LIS]) and have impaired eyes muscles control. We aimed to improve visual interfaces for ALS-LIS patients in order for them to control the movement of a cursor on a monitor. To this aim, we designed two new interfaces that required the users to orient their covert visuospatial attention. One interface exploited the principle of Exogenous visuospatial attention orienting, whereas the other exploited Endogenous visuospatial attention orienting. Ten ALS patients with different levels of impairment used the two new interfaces in an event-related potentials (ERPs)-based BCI, developed for controlling the movement of a cursor on a monitor. Their task was to reach with the cursor one out of four icons, which was indicated by the experimenter at the beginning of each session. ALS patients performed 16 sessions with each interface during eight consecutive days. During each session, the ERPs, elicited on each trial, were recorded. By using an ad-hoc classification algorithm, the ERPs were processed on-line and translated into discrete cursor movements. ALS patients reached good performance (i.e., classification accuracy of targets and non-targets in percentage) of about 70% with both the interfaces, but the accuracy in target classification was higher with the Endogenous Interface than with the Exogenous, $t(9) = 1.96$, one tailed $p < .05$. Furthermore, the Endogenous interface was associated both with faster communication speed ($t(9) = 2.31$, one tailed $p < .05$) and with higher rate of target icons reached by the cursor ($t(9) = 3.32$, one tailed $p < .01$), with respect to the Exogenous interface. ALS patients were able to use their covert visuospatial attention in order to control an ERP-based BCI system in real time. Nevertheless, better results were associated with the Endogenous interface than with the Exogenous interface. The results support the idea that ALS patients can use the covert visuospatial attention orienting in order to control an ERP-based BCI, without the need of moving their eyes. Interfaces based on covert visuospatial attention offer a new solution for the communication problems in ALS patients with impaired eyes muscles control. Moreover, the use of the Endogenous visuospatial attention orienting leaded to better performance. This represents a costless improvement in ERP-based BCI interface design. We suggest that more attention be paid to the neuropsychological aspects involved in interfaces design, for researchers to develop more efficient BCIs for ALS patients.

How does buzz the surgeons brain? An EEG coherence study while they work in conventional laparoscopic or robotic modality

Bocci T. [1, 2] **- Moretto C.** [3] **- Tognazzi S.** [4] **- Briscese L.** [1] **- Naraci M.** [1] **Leocani L.** [5] **- Mosca F.** [6] **- Ferrari M.** [7] **- Sartucci F.** [1, 4, 8]

[1] *Department of Neuroscience, Unit of Neurology, Pisa University Medical School, Pisa, Italy*

[2] *Department of Neuroscience, Neurology and Clinical Neurophysiology Section, Azienda Ospedaliera Universitaria Senese, Siena, Italy*

[3] *Bariatric and Metabolic Surgical Unit, Cisanello Hospital, Pisa, Italy*

[4] *Department of Neuroscience, Cisanello Neurology Unit, Azienda Ospedaliera Universitaria Pisana, Pisa,Italy*

[5] *Institute of Experimental Neurology, Division of Neuroscience, Scientific Institute and University Ospedale San Raffaele, Milan, Italy*

[6] *Division of General Surgery, Pisa University Medical School, Pisa, Italy*

[7] *Department of Vascular Surgery, Pisa University Medical School, Pisa, Italy*

[8] *CNR Neuroscience Institute, Pisa, Italy*

In human, both primary and non-primary motor areas are involved in the control of voluntary movements. However, the dynamics of functional coupling among different motor areas has not been fully clarified yet. There is to date no research looking to the functional changes in the brain of surgeons working in laparoscopy compared with those trained and working in robotic surgery. We enrolled 16 right-handed trained surgeons and assessed changes in intra- and inter-hemispheric EEG coherence with a 32-channels device during the same, simplified motor task with either a robotic or a laparoscopic approach. Estimates of auto and coherence spectra were calculated by a fast Fourier transform algorithm implemented on Matlab 5.3. Because coherence data depend on the recording type and, in particular, are highly sensitive to signal variations at the common reference, we further checked the intra-individual reproducibility of our results under different montage schemes. We off-line converted our initial Cz reference into common average, bipolar, and ipsilateral earlobe reference montages, which all emphasize different properties of the EEG signals. The analysis of coherence revealed a significant increase in intra-hemispheric coherence in the range of theta activity in surgeons using a conventional laparoscopic approach, compared both with resting condition (SMA vs. M1: $F = 7.9$, $p = 0.012$; SMA vs. S1: $F = 7.7$, $p = 0.014$; M1 vs. S1: $F = 14.2$, $p = 0.0019$) and robotic surgery (SMA vs. M1: $p < 0.001$; SMA vs. S1: $p < 0.001$; M1 vs. S1: $p < 0.0001$). Similar results were found by comparing S1 with pre-SMA (laparoscopy vs. resting condition: $p = 0.0025$; laparoscopy vs. robotic surgery: $p = 0.0006$). Concurrently, we revealed a significant increase in inter-hemispheric coherence in the range of beta activity in surgeons using the robotic device compared both with resting condition

(right vs. left M1: $F = 13.7$, $p < 0.001$; right vs. left S1: $F = 12.7$, $p < 0.005$) and laparoscopy (right vs. left M1: $p < 0.0001$; right vs. left S1: $p < 0.0001$). Similar results were found by comparing right M1 with left pre-SMA (laparoscopy vs. resting condition: $t = 6.68$, $p < 0.001$; laparoscopy vs. robotic surgery: $t = 7.57$, $p < 0.001$) and left M1 with right pre-SMA (laparoscopy vs. resting condition: $t = 5.32$, $p < 0.001$; laparoscopy vs. robotic surgery: $t = 5.85$, $p < 0.001$). Our data provide a semi-quantitative evaluation of dynamics in functional coupling among different cortical areas in skilled surgeons performing laparoscopy or robotic surgery. These results suggest that motor and non-motor areas are differently activated and coordinated in surgeons performing the same task with different approaches. To the best of our knowledge, this is the first study that tried to assess semi-quantitative differences between robotic and laparoscopic procedures.

Electrocortical markers of lying

Vanutelli M.E. - Adorni R. - Mado Proverbio A.

Department of Psychology, University of Milan-Bicocca, Milan, Italy

Lying, as a deplorable behavior, induces changes in the vegetative system because of the sense of guilt and the anxiety of being uncovered, and the current lie-detectors, as the polygraph, register these changes as cues of a deceptive behavior. Such modulations, however, aren't direct measures of deception per se, but products of emotions in general that could also affect an innocent suspect, wrongly accused. But what happens in the brain? Is it possible to define the relationship between lies and emotions? The purpose of this study was thus to investigate the neural correlates of deceptive behavior in response to neutral and affective questions, created ad-hoc, through the analysis of the electrocortical indexes registered in healthy volunteers. ERPs were recorded from 128 sites. From ERP responses it was possible to notice, at anterior brain areas, a late modulation of the electrocortical activity during the lying versus the telling the truth condition, according to the affective valence of the stimuli. This finding is particularly relevant in that it confirms the ambiguity of data coming from studies related to peripheral indexes measures. An earlier peak was found over the prefrontal regions that distinguished between truthful and mendacious responses, irrespective of the affective context. This component would thus represent the neural marker of deception. A swLORETA linear inverse solution was computed on its amplitude. The results showed that a deceptive behavior is related to the activation of anterior brain areas reflecting an increasing need in higher-level cognitive functions, namely working memory, conflict monitoring, controlled- and task switching-processes, also suggested by behavioral responses.

Transcranial electrical stimulation (TES) modulate plasticity in a perceptual learning task

Pirulli C. [1] **- Fertonani A.** [1] **- Miniussi C.** [1, 2]

[1] *Cognitive Neuroscience Section, IRCCS San Giovanni di Dio Fatebenefratelli, Brescia, Italy*

[2] *Department of Biomedical Sciences and Biotechnologies National Institute of Neuroscience, University of Brescia, Italy*

Transcranial electric stimulation (tES) protocols are able to modulate neural plasticity, offering important insights to focus and constrain theories of the relationship between the brain and behaviour. Previous studies have shown that different types of tES (i.e., transcranial direct current stimulation – tDCS and transcranial random noise stimulation – tRNS) induce different behavioural effects. However to date is not clear which are the best parameters (i.e., timing and presence of pauses) to apply tES to obtain reliable effects. In this work we performed two experiments. In Experiment 1 the goal was to investigate how tDCS and tRNS can modulate plasticity in the healthy adult brain in relation to their timing of application. In Experiment 2 the aim was to understand if the presence of pauses during the stimulation may induce different behavioural effects during a perceptual learning task. The stimulations were delivered by a battery-driven stimulator through a pair of saline-soaked sponge electrodes, one applied on V1 and the other on the right arm. We used an orientation discrimination task (ODT). Participants had to decide whether the presented stimulus was tilted clockwise or counterclockwise relative to the previously presented stimulus.In both experiments the stimulations were applied during (online condition) or before (offline condition) the ODT execution in a between subjects experimental design. In Exp. 1 we had seven stimulation groups: anodal tDCS (a-tDCS online and offline), cathodal tDCS (c-tDCS online and offline), high frequency tRNS (online and offline) and sham. In Exp. 2 we had five stimulation groups of: continuous-c-tDCS (online and offline), intermittent-c-tDCS (online and offline) and sham. In Exp. 1 we observed an improvement of the performance when a-tDCS was applied before the task (offline), whereas with tRNS we had a great improvement in the performance only during the task execution (online). Surprisingly an analogous improvement was present with offline c-tDCS whereas online c-tDCS was similar to sham. In Exp. 2 we observed a difference between continuous-c-tDCS and intermittent-c-tDCS. The main result of this study is the finding that the timing of identical tES protocols yields opposite effects on synaptic plasticity. Indeed, the effects of tES are highly dependent on the timing of the stimulation and on the presence of pauses during stimulation. These results confirm our hypothesis that the state of cerebral activation, when the non-invasive brain stimulation is applied, is important for inducing neural plasticity. Our results confirm that exists an ideal timing of application, depending on the type of stimulation. In addition, it is important to consider that the effects of tES depend on several parameters (i.e, timing and pauses) related to the technique. These results are important for the designing of rehabilitation protocols, highlighting the importance of a careful choice of stimulation parameters.

The effects of musical expertise on reading skills: an ERP study

Manfredi M. [1] **- Adorni R.** [1] **- Zani A.** [2] **- Mado Proverbio A.** [1]

[1] *Department of Psychology, University of Milan-Bicocca, Milan, Italy*

[2] *IBFM-CNR, National Council Research (CNR), Segrate, Italy*

Several studies showed that an early music training modifies functional brain structure and enhances connectivity, but little is known about the effects of training in notation reading on brain plasticity. The aim of this study was to compare visual processing of notes and words in 15 professional musicians and 15 controls while EEGs recorded their visual processing. Stimuli comprised 300 words and 300 short (1 measure) music scores that were randomly presented at the center of a PC screen located approximately 114 cm from the viewer's eyes. Thirty healthy right-handed participants (18 males and 12 females) were recruited for this experiment. They were matched for cultural status and education level (except for musical expertise) across groups. All had normal or corrected-to-normal vision and reported no history of neurological illness or drug abuse. Half of them were professional musicians with a Conservatory degree in violin, trumpet, clarinet, piano, composition, orchestra conduction. Musicians usually read their music scores in Violin and/or Bass clefs. The mean age of acquisition (AoA) of musical abilities (playing an instrument) for musicians was 8.57 years. The mean age of musicians was 31.7 years (SD = 12), while of control was 26 ys. (SD = 69). Non musicians (control group) were totally unable to read musical notation as determined by a note reading test (solfeggio) administered prior to recruitment. People who recognized a single note were not enrolled in the study. Handedness was assessed with the Italian version of the Edinburgh Handedness Inventory, a laterality preference questionnaire. All participants reported strong right-handedness and right ocular dominance. In this study 300 Italian words and 300 musical beats were presented for 1600 ms in the central visual field. ERPs were recorded from 128 scalp sites in a group of Italian University students and in a group of professional musicians. The task consisted in paying selective attention to a given note or letter included (or not) in the musical measures or words presented, and in responding to targets by pressing a button as accurately and quickly as possible. Letter processing was strongly left lateralized in controls, while the fusiform (BA37) and inferior occipital gyri (BA18) were activated in both hemispheres in musicians during both word and music reading. The hypothesis is advanced that the recruitment of right occipital/temporal areas during orthographic reading, in musicians, might depend on their early acquisition of music reading ability. Our study provides evidence, for the first time, that the early learning of the musical notation system may affect the neuroanatomical and functional mechanism of visual word recognition.

Reinforcement learning is mediated by medial orbitofrontal cortex: evidences from transcranial direct current stimulation (tDCS)

Schiff S. [1, 2] **- Casula E.** [3] **- Imperato G.** [1] **- Caregaro L.** [1] **- Amodio P.** [1]

[1] *Department of Medicine, University of Padua, Padua, Italy*

[2] *IRCCS San Camillo, Venice, Italy*

[3] *Department of General Psychology, University of Padua, Padua, Italy*

Reinforcement learning refers to the ability to use action outcomes to shape knowledge and to make predictions on the consequence of future choices. In a natural environment the outcomes of our choices are frequently characterized by some degree of uncertainty, in other words most of our choices are based on non-deterministic predictions of environmental outcomes. The medial orbitofrontal cortex (mOFC) is considered a key area of the brain that represents events value and that is involved in reinforcement learning, however the causal relation of this area in reinforcement learning was never investigated in healthy individuals. The objective of the present study is to test the role of the mOFC in reinforcement learning. Thirteen healthy individuals participated to the study and undergo to three experimental sessions. In each session, participants perform a probabilistic learning (PL) task while anodal, cathodal or sham transcranial direct current stimulation (tDCS) was applied over the mOFC. In each trial two Japanese ideograms were displayed on the left and on the right of the fixation point and participants were instructed to make choices between the two alternatives. Three fixed pairs of ideograms (AB, CD, EF) were randomly and equally presented during the task and each ideogram was associated to a different probability of receiving positive/negative feedbacks: A = 0.8/0.2, B = 0.2/0.8, C = 0.7/0.3, D = 0.3/0.7, E = 0.60/0.4 and F = 0.4/0.6, respectively. After each choice probabilistic feedback was provided depending on the selected ideogram. Participants were instructed to identify the best alternative in each pairs of ideograms and to use positive/negative feedbacks as reinforce for the future choices. In each session tDCS was delivered at 2 mA for 25 minutes with the active electrode (25cm^2) placed over Fpz (EEG sys) and the reference electrode (64cm^2) placed over Oz. After the PL task (learning phase) a test phase was delivered to evaluate the implicit probabilistic associations derived from the positive/negative feedbacks received during the learning phase. In the test phase, the new pairs AC, AD, AF, AE and BC, BD, BE, BF were presented without feedbacks and participants were invited to make their choices using the knowledge acquired during the PL task. During cathodal stimulation of the mOFC participants were significantly less accurate in performing the PL task, both compared to sham and anodal stimulation. In addition, in the test phase, after anodal tDCS, participants were less confident in their choices when they had to select the alternative that was associated more frequently with positive feedbacks in the preceding learning phase. The present results demonstrate the causal relationship between mOFC and reinforcement learning. Our data support the idea that the mOFC is involved in the representation of the positive value associated to a particular event.

rTMS on the left dorsolateral prefrontal cortex during an emotional memory task improves the performance of the retrieval process as function of level of anxiety and stimulus valence

Balconi M. - Ferrari C.

Laboratory of Cognitive Psychology, Department of Psychology, Catholic University of Sacred Heart, Milan, Italy

Anxiety behaviour showed a consistent attentional bias toward negative and aversive memories, induced by a right prefrontal cortical superiority, based on an "unbalance effect" between the two hemispheres. In the present research we explored the contribution of the left dorsolateral prefrontal cortex (DLPFC) in memory retrieval process of positive vs. negative emotional stimulus, as a function of the anxiety level. The left DLPFC stimulation is supposed to modulate the "right superiority" in high level anxiety profile, by a decreasing of the attentional bias for negative cues. Material: Subjects, who were divided in two different groups depending on their anxiety level (high/low-anxiety, STAI), were required to perform a task consisting in two experimental phases: an encoding-phase (lists composed by positive and negative emotional words); and a retrieval-phase (old stimuli and new stimuli to be recognized). Moreover, new stimuli (distractors) were semantically related or unrelated to the old stimuli to test a possible interference effect induced by the semantic association. The left DLPFC effect was analyzed by using a high frequency rTMS (repeated transcranial magnetic stimulation) sham-controlled paradigm that induced a cortical activation of the left DLPFC. The rTMS stimulation over left DLPFC affected the memory retrieval, as a function of anxiety level and stimulus valence. High-anxiety subjects showed a typical attentional bias for aversive cues in comparison with low-anxiety subjects. However, they benefitted in greater measure to the prefrontal left stimulation with a reduced negative bias (increased accuracy and reduced RT for the positive stimuli) and a significant increased performance for the semantically related distractors (reduced interference effect). These results suggested that left DLPFC activation increases the memory retrieval of positive emotional information and might limit the "unbalance effect" induced by a right hemispheric superiority in high level of anxiety. Moreover, this effect was related to both retrieval of positive old memories and detection of semantically related distractors.

Laser evoked potentials in vegetative and minimally conscious states: case reports

Vecchio E.[3] **- Navarro J.**[1] **- Ricci K.**[3] **- Lanzillotti C.**[1] **- Uonocunto F.**[1] **Colonna F.**[1] **- Resta M.**[2] **- Lancioni G.**[3] **- Livrea P.**[3] **- De Tommaso M.**[3]

[1] *Fondazione San Raffaele, Presidio Ospedaliero di Riabilitazione ad Alta Specialità, Ceglie Messapica, Brindisi, Italy*

[2] *Ospedale SS. Annunziata, ASL Taranto 1, Taranto, Italy*

[3] *Dipartimento di Scienze Mediche di Base, Neuroscienze e Organi di Senso, Università di Bari Aldo Moro, Bari, Italy*

Pain perception is currently an open question in patients suffering from prolonged disorders of consciousness. In this study we aimed to examine laser evoked potentials (LEPs) in patients with vegetative (VS) and minimal conscious state (MCS), in light of main clinical features, Nociception Coma Scale (NCS), mismatch negativity (MMN) and late cortical responses evoked by innocuous not noxious electric somatosensory stimuli (lSEPs). Three VS, 4 MCS patients and 11 age and sex matched controls were examined. Evoked responses were obtained by 64 scalp electrodes, stimulating the dorsum of the right hand by noxious laser and innocuous electrical stimulus, according to normal controls subjective rating. For MM, the presented stimuli were 1500 pure tones of 1000 Hz (85%, standard) and 1500 Hz (15%, deviant). Topographic analysis was performed for each patient, modeling cortical responses over individual MRI. The MM was present in all patients, though 2 patients with MCS displayed a significant amplitude reduction on frontal derivations. LEP vertex complex was recognizable in all cases, with a significant latency increase of both N2 and P2 and a topographic scalp rearrangement. Late SEPs were absent in all patients except in one MCS case, who showed a significant N2 and P2 latency increase. Our results may suggest that high relevant stimuli may be processed even in patients with severe brain damage. Larger series and multimodal approaches may contribute to confirm that cortical arousal toward pain salience may be a primary function for life persistence.

Detection of short-term habituation (STH) in patients with disorder of consciousness (DOC): preliminary results

Comanducci A. [1] - **Spalletti M.** [1] - **Gori B.** [1] - **Martinelli C.** [1]
Carrai R. [1, 2] - **Pinto F.** [1] - **Amantini A.** [1] - **Grippo A.** [1, 2]

[1] *Unit of Clinical Neurophysiology, DAI Neurological Sciences, AOU Careggi, Florence, Italy*
[2] *UOF Riabilitazione Neurologica, Fondazione Don Carlo Gnocchi Onlus IRCCS, Florence, Italy*

Short-term habituation (STH) is known as a fundamental component of attention as it represents a "bottom-up" filtering for salient stimuli and, at the same time, a prerequisite for subsequent "top-down" processing. STH can be detected using a simple passive paradigm in which trains of stimuli belonging to identical or different modality were presented. Our aim was to ascertain if STH is preserved in patients with different levels of disorder of consciousness (DOC).We selected 30 DOC patients (emerging/high grade MCS / low grade MCS/VS, assessed with standardized neurobehavioral examination [Coma Recovery Scale - Revised, CRS-R]) of different aetiologies (haemorrhagic, traumatic and post-anoxic) Every patient underwent a complete neurophysiological study that included EEG with reactivity evaluation, somatosensory evoked potentials, ERPs with passive oddball protocol and finally STH protocol. STH protocol provides for the delivery of trains of three stimuli (triplets S1-S2-S3): S1 and S2 always belongs to the same sensory modality (auditory or somatosensory) whereas S3 can belong either to the same modality (as S1 and S2),triplet "same" or to the other modality, triplet "different". Amplitude of long latency evoked potentials (N1-P2) in response to different stimuli was then compared in order to detect any STH. In order to verify the reproducibility, seven patients were also retested. Acoustic and/or electric STH was found in all emerging and high-grade MCS patients. STH was qualitatively and quantitatively comparable to that obtained in healthy subjects. An acoustic STH sometimes atypical (N1 modulation), was also detected in every low-grade MCS. STH was absent in 50% VS (6/12) patients while it was someway preserved in the remaining 50% VS patients. Two among of the VS patients showing STH, subsequently became minimally conscious. One VS patient, who did not present any STH phenomenon did not change his clinical status 3-months later. In addition, 1/3 of our patients (everyone with a clear acoustic or electric STH) presented also a P3-a response. STH process is a preserved phenomenon in emerging and MCS patients showing features similar to healthy subjects. An acoustic STH was also found in every low-grade MCS and in some VS patients. Two of these VS patients later regained some grade of consciousness. None of the emerging/high grade MCS and low grade MCS did not show a significative acoustic or electric STH phenomenon. In this view, our "triplet" protocol could be able to pick-up preserved elementary information processing in DOC patients. Further outcome correlations are however needed in the VS group to assess a possible prognostic significance according to triplet responses.

Blink-related alpha and beta oscillations differentiate between minimally conscious state and unresponsive wakefulness syndrome/vegetative state

Bonfiglio L. [1] **- Piarulli A.** [2] **- Olcese U.** [3] **- Arrighi P.** [1] **- Andre P.** [4]
Virgillito A. [1] **- Crecchi A.** [1] **- Frisoli A.** [2] **- Rossi B.** [1]
Bergamasco M. [2] **- Carboncini M.C.** [1]

[1] *Department of Neuroscience, Unit of Neurorehabilitation, AOUP, Pisa, Italy*

[2] *PERCRO Laboratory, Scuola Superiore Sant'Anna, Pisa, Italy*

[3] *Italian Institute of Technology, University of Genova, Genova, Italy*

[4] *Department of Physiology, University of Siena, Siena, Italy*

Recently, we have shown the existence of EEG delta blink-related oscillations (delta BROs), which are peculiar to the resting state of the healthy subject. The hypothesis is that they can represent the activation of updating and short-term memorization of the context, which are at the basis of the global (gestaltic) awareness of the visuo-spatial environment. As expected, the source of these oscillations was located in the precuneus, whose function is believed to be the surveillance of the internal and external environments and some assessment of salience of stimuli for the individual. In patients with disorders of consciousness (DOC), delta BROs were poorly represented, so that it was not possible to identify unambiguous and homogeneous sources. However, parameters such as power and phase synchronization of delta BROs was directly proportional to the levels of consciousness expressed by the Levels of Cognitive Functioning Scale (LCFS) scores. Nevertheless, at the group level, it was not possible to statistically distinguish minimally conscious state (MCS) from unresponsive wakefulness syndrome/vegetative state (UWS/VS). In an effort to increase our capabilities of differential diagnosis, and taking into account that brain responses are to be considered as the superposition of multiple oscillations, we have extended our analysis to other frequency ranges than delta. EEG activity at rest was recorded in 12 healthy subjects and 9 patients with DOC (5 MCS, and 4 UWS/VS). Three-second-lasting EEG epochs centred on each blink instance were analysed in both time- (BROs) and frequency-domains (event-related spectral perturbation or ERSP). Cortical sources of blink-related band power maxima were estimated by Sloreta. It was thus possible to obtain a statistically significant differentiation between MCS and UWS/VS on the basis of both alpha and beta oscillations within a time window of about 1000ms after the blink. The brain region that turned out to be more active in MCS with respect to UWS/VS was the precuneus (which was however still deficient compared to healthy subjects). The brain regions that turned out to be more active in MCS with respect to both healthy and UWS/VS subjects were the left temporo-parietal junction and, to some extent, the left pre-frontal cortex.The activation of such a fronto-parieto-temporal network in MCS subjects could be interpreted as a compensatory mechanism to the current condition of functional insufficiency of the precuneus.

The tDCS effect on ERP profile for the semantic representation of action. The role of DLPFC

Balconi M. - Vitaloni S.

Laboratory of Cognitive Psychology, Department of Psychology, Catholic University of the Sacred Heart, Milan, Italy

Representation of action within an object-related dynamic context was considered as a semantic task similar to word comprehension within a linguistic context. Indeed it has been hypothesized that the mechanisms involved in the perception of action sequences may be similar to those associated with the processing of language. That is, action comprehension was seen as a specific semantic processing where context-action representation resulted integrated as in the word-sentence representation. The aim of the present research was firstly to investigate the effect of tDCS on a specific ERP deflection (N400 effect) when subjects processed a congruous/incongruous object-related action. Secondly, the contribution of tDCS to modulate the cortical response of the dorsolateral prefrontal cortex (DLPFC) was explored. We supposed that the inhibition of anterior DLPFC area may induce a decreased ability to produce a concomitant N400 effect. Thirty subjects performed a detection task when congruous or incongruous sequences of action (video tapes). The procedure was subdivided into three phases. Prior to tDCS stimulation, a baseline task was conducted on a separate day, and EEG was registered (phase 1). The participants were required to press a left or right pulse of the mouse depending on whether the final action target frame represented a congruous or an incongruous ending scene. Successively tDCS/sham stimulation was induced (phase 2) on the subjects. Finally, immediately after tDCS/sham stimulation (phase 3) subjects were submitted to the same experimental task of phase 1. The EEG was registered during the task execution using the same procedure of EEG acquisition adopted in phase 1. The stimulation effect (cathode applied on the DLPFC and anode on the control site) was tested comparing the behavioural (RTs) and ERP profile before and after the stimulation (or sham effect) applied on the frontal areas. A significant N400 reduction was observed for incongruous stimuli in case of cathodic stimulation of DLPFC compared with the pre-stimulation condition. Also RTs were modified in case of tDCS application when subjects processed incongruous actions. It was suggested that the inhibition of DLPFC may limit the ability to analyze the semantic anomaly induced by action representation. Secondly, the contribution of the frontal areas for the semantic processing of action was supported. Finally, the N400-like effect was largely modulated by tDCS, as shown by comparing pre- and post-stimulation ERP profiles. The effect of tDCS applied over prefrontal cortex to explore action semantic processing was demonstrated and currently we tested for changes in the RT and ERP cortical responses induced by direct current stimulation.

Affordance encoding in the motor cortex: a TMS state-dependent study

Bartoli E.[1] **- Maffongelli L.**[1] **- D'Ausilio A.**[1] **- Jacono M.**[1] **- Fadiga L.**[1, 2]

[1] *Istituto Italiano di Tecnologia, Genova, Italy*

[2] *Università di Ferrara, Ferrara, Italy*

The term affordance defines an attribute arising from visual properties of objects and motor information, which derives from the possible interaction that an agent can carry out with that object. The motor program that an object evokes in an agent can be represented as a pattern of muscle contractions and joint positions. This pattern of activity (or motor synergy) should therefore be primed by the visual presentation of an object. Although monkey neurophysiological studies show a parieto-frontal network extracting affordance-related features of objects, this system (canonical neurons) remains elusive in humans. Here we tested whether it is possible to selectively pre-activate some pattern of finger-movements when observing objects. Moreover, we are interested in studying the interaction between the mirror and canonical neuron networks by using an adaptation paradigm. In this study we applied the paradigm of visual adaptation in order to segregate neural populations responding to two different intransitive grasp actions: precision and power grasp. In each trial, after visual presentation of one of the two adapting movements, an object offering clear affordance (for precision or power grasp) was presented. A single TMS pulse was delivered over M1 hand representation during the presentation of the object, in order to test the hypothesis of specific motor priming given by the object's features. In addition, a mismatch between visual adaptation and object affordance was introduced so as to test the effect of perturbing the system's stability online and therefore the state-dependency of such effects. Motor evoked potentials were recorded from *Abductor Pollicis Brevis* (APB) and *Abductor Digiti Minimi* (ADM). Reaction times increased when a mismatch was present between the adaptation movement and the object affordance, suggesting a cross-modal adaptation between the observation of an action and of the object presented. MEPs showed an increase in size for the action-affordance matching condition involving precision grasp in APB muscle, whereas a modulation for the action-affordance matching condition involving power grasp was found in ADM. Altogether, the results support the possibility of priming a specific and congruent motor pattern by the visual presentation of an object offering an affordance. The action-affordance mismatching conditions showed an intermediate pattern of motor evoked responses, thus supporting the hypothesis that the state of the system plays a fundamental role in the physiological object-related responses. Therefore, cortico-spinal excitability maps the specifics of the affordance offered by a visually presented object. Nevertheless, these measures can be biased in a state-dependent manner. Here, with an adaptation protocol, we show a cross-system functional link between mirror and canonical neuron neural circuits.

Modulating the effect of learning on spatial conflict: a tDCS study

Bardi L. [1] **- Schiff S.** [2] **- Mapelli D.** [1]

[1] *Department of General Psychology, University of Padua, Padua, Italy*

[2] *Department of Medicine, University of Padua, Padua, Italy*

Upon encountering stimuli that present action affordances, visual irrelevant information may activate incorrect motor responses with respect to our current goals. When this happens, a conflict arises at the response selection stage. In the Simon task, participants are instructed to respond to a non-spatial attribute of a stimulus (e.g., the color) and to ignore its position. Despite the fact that spatial information is irrelevant to the task, responses are faster when stimulus and response position correspond than when they do not correspond. The Simon effect is defined as the difference in reaction times between non-corresponding and corresponding trials. Although the effect of spatial correspondence is very robust, it has been shown that it can be modulated by prior practice on a spatial compatibility task with incompatible mapping. In particular, the Simon effect disappears if, before performing the Simon task, participants practice with an incompatible mapping. This effect of practice reveals a transfer of learning of new stimulus-response associations from one task to the other. In the present study we investigated whether transcranial direct current stimulation (tDCS) of the premotor cortex can modulate the effect of practice. Three groups of participants performed the Simon task in two sessions (baseline and transfer sessions) interleaved by a spatial compatibility task (practice session). In the spatial compatibility task, participants were required to respond to the location of the target (left response to right stimuli, right responses to left stimuli). The group 1 underwent the experimental procedure without stimulation. In the group 2 and 3, anodal tDCS and cathodal tDCS, respectively, were applied to the premotor cortex of the left hemisphere during the practice session. The analysis of reaction times showed that the SImon effect was reduced from the baseline to the transfer session in all the groups, revealing a clear effect of practice. However, the analysis of responses performed with the right hand showed that tDCS was able to modulate the effect of practice on the execution of the subsequent Simon task. In particular, the effect of practice was increased after cathodal tDCS (group 2) while a tendency to the opposite direction was observed after anodal tDCS (group 3). These outcomes revealed that brain stimulation is able to modulate the effect of learning induced by behavioural practice. These results might contribute to prove the relevance of the development of applied techniques combining cognitive training and tDCS in order to improve mechanisms of cognitive control.

The organization of the neural networks involved in preparing reaching movements in humans investigated by the application of TMS0 and TMS/EEG

Busan P. [1] **- Zanon M.** [2] **- Vinciati F.** [1] **- Monti F.** [3]
Pizzolato G. [3] **- Battaglini P.P.** [1]

[1] *BRAIN Center for Neuroscience, Department of Life Sciences, University of Trieste, Trieste, Italy*

[2] *Department of Medical and Biological Sciences, University of Udine, Udine, Italy*

[3] *Department of Medical, Surgical and Health Sciences, University of Trieste, Trieste, Italy*

Our previous behavior/TMS findings showed a discrete stream of regions, from the parietal to the frontal cortex, which is involved in the preparation of reaching movements. Focusing the attention on the parietal cortex, we also individuated, by TMS/EEG co-registration, further cortical areas of the temporo-occipital region that could also be involved in movement preparation and execution. Here, additional experiments are presented, in order to extend those results and better define the functionality and dynamics of this network. In the behavior/TMS experiments, 58 healthy subjects underwent single pulse TMS over different cortical regions of the left hemisphere while preparing a reaching movement. A series of points on the skull, located on the lateral parieto-occipital, parietal and premotor areas, were stimulated during the preparation of reaching movements. Subjects performed 42 randomized trials for each stimulated point on the skull: 21 trials with and 21 without TMS. In the TMS/EEG experiment, single TMS pulses were delivered over the left parietal cortex on nine healthy right handed subjects during continuous registration of EEG activity. The real TMS distribution of neuronal activity was computed and compared with respect to sham TMS. A voxel-by-voxel within-subjects comparison of current density distribution of real vs. sham TMS induced activity was performed. No specific effects were found on reaction times as a consequence of TMS delivery in the behavior/TMS experiments. In the TMS/EEG experiment, ERPs showed both positive and negative deflections, the amplitude of which was lower in the case of sham TMS. When considering current density distribution, significant differences were found between real and sham TMS in the time ranges between 116-126 msec, 134-146 msec, and at about 190 msec after the delivery of the stimulus, as well as in the mean neural activity of specific time windows of interest (60-130 msec, 130-245 msec and 245-300 msec, respectively). The propagation of activity, probably related to the preparation of reaching movements, seems to involve wide regions of the brain, distributed in the frontal, temporal, parietal and more posterior cortex. Besides the known serial flow of activation from posterior to anterior direction, a parallel elaboration of information among parietal and premotor areas seems also to exist. Moreover, segregation among these neural systems seems not to be highly restrictive, since present data point in favor of the existence of an overlap between different neural structures that are needed for the implementation of different

movements. The description of the many cortical regions which are involved in the preparation of movement, their organization and dynamics is a fundamental prerequisite for the development of brain-computer interfaces to be used in brain injured patients for rehabilitation and support to physical therapy.

Brain areas involved in temporal discrimination task: a study with ERPs and TMS

Giovannelli F. [1, 2] **- Ragazzoni F.** [1] **- Battista D.** [1] **- Del Sordo E.** [1]
Cardinali C. [1] **- Marzi T.** [2] **- Borgheresi A.** [1] **- Zaccara G.** [1]
Viggiano M.P. [2] **- Cincotta M.** [1]

[1] *Unità Operativa di Neurologia, Azienda Sanitaria di Firenze, Florence, Italy*
[2] *Department of Psychology, University of Florence, Florence, Italy*

Time processing in the millisecond-to-minute range is reflected by event-related potentials (ERPs), but the neural circuits of timing remains controversial. In the present study we investigated the role of different cortical areas in the processing of basic temporal information using an interference approach with repetitive transcranial magnetic stimulation (rTMS) and ERPs as indices of timing mechanisms. Nine healthy volunteers performed a temporal discrimination task in which they had to decide whether the time interval between two tones was shorter (800 ms), equal to, or longer (1200 ms) than a previously listened standard interval (1000 ms) and press different buttons accordingly. The task was performed at the baseline and immediately after a 15-min-long train of focal 1-Hz rTMS delivered to supplementary motor area, right posterior parietal cortex, right superior temporal gyrus, or Oz (control area). Accuracy and reaction times and ERPs during (contingent negative variation, CNV) and after the end of the comparison interval were analyzed. At the baseline, CNV was modulated by the interval duration and the analysis of the ERP evoked after the end of the comparison interval showed that the amplitude of the positive peak emerging approximately after 200 ms was higher for "Long" compared to "Short" intervals, whereas amplitude for "Equal" was intermediate. RTMS interference had no significant effect on behavioural performance or ERP components. These data may suggest that these cortical areas are less crucially involved than other brain regions (e.g. sub-cortical or cerebellar areas) in the neural mechanisms processing basic temporal information like interval duration.

Can mirror-like properties generalize across effectors? A TMS study

Finisguerra A. [1] - **Maffongelli L.** [1] - **Bassolino M.** [1] - **Jacono M.** [1]
Pozzo T. [1, 2] - **Fadiga L.** [1, 3] - **D'ausilio A.** [1]

[1] *Istituto Italiano di Tecnologia, Genova, Italy*

[2] *U1093, Cognition Action Plasticité Sensorimotrice, Dijon, France*

[3] *University of Ferrara, Ferrara, Italy*

Observation of others' actions modulates the excitability of the observers' corticospinal pathway involved in the execution of the same movement, revealing the existence of a mirror neuron system also in humans. In the past 20 years a lot of studies explored which features of the observed action are reflected in the observers' motor system. Previous evidences suggested that motor activity mirrors the observed action for muscles specificity, time-course and exerted forces. In contrast with these "low level" sensorimotor features, other studies highlighted the importance of the goal of the observed action regardless of the muscles involved to attain it. Although the facilitation of the motor system during action observation is widely accepted, the issue of granularity and generalization power of this system in humans remains still partly unexplored. Here we explore if the cortical facilitation induced by action observation could be generalized to an abstract representation of the observed action. In fact, the motor system might code fine details of others' action without losing the ability to generalize motor invariants to a more abstract level. Specifically, here we test whether the same pattern of muscle facilitation evoked by the observation of a given action may extend to conceptually similar movements even if performed by different effectors. To address this question we presented videos showing the hand or the mouth executing two different movements (opening/closing) in a lateral view. In 14 subjects we measured the activity of the flexor digitorum superficialis (FDS), a muscle usually involved in the closure movement by using single-pulse TMS. We found that motor evoked potentials (MEPS) were significantly larger during the observation of closing movement than during the observation of the opposite one for the hand as well for the mouth. For the presentation of hand actions we found the classic mirror resonance following the expected pattern of muscle specificity. However, the fact that an analogous pattern was shown also with mouth actions let us speculate that such low-level mirroring can indeed generalize between effectors. In fact, this modulation loses strict muscle specificity (for the mouth) but retains the critical invariances, such as the hierarchically more abstract concept of opening and closing. This result goes into the stream of studies demonstrating the centrality of goal rather than muscle-level resonance and provides evidence that the motor system possess the capability to generalize a given action. This generalization could be at the basis of a conceptual representation of the observed action. It is worth noting, that the two effectors used as stimuli have a strong connection due to their synergic proprieties.

State dependent effects of transcranial alternating current stimulation of the motor system: what you think matters

Feurra M. [1] **- Pasqualetti P.** [2] **- Bianco G.** [1] **- Santarnecchi E.** [1]
Rossi A. [1] **- Rossi S.** [1]

[1] *Department of Neuroscience, Neurology and Clinical Neurophysiology Section, Siena, Italy*

[2] *Medical Statistics and Information Technology, AFaR - Fatebenefratelli Association for Research, Isola Tiberina, Rome, Italy*

Recent evidences suggested that imperceptible transcranial alternating current stimulation (tACS) resonates in a frequency-specific manner with the endogenous cortical oscillatory activity. Such a phenomenon causes behavioral consequences on perceptual, motor and cognitive tasks. In the motor system, 20 Hz tACS in beta range, coincident with the idling rhythm of the motor cortex at rest, increased corticospinal output. To assess how tACS modulates corticospinal excitability in a differential frequency dependent fashion during motor imagery and rest, we delivered transcranial oscillatory frequencies on the primary motor cortex ranging from theta to gamma band. Thus, we aimed to verify whether facilitatory tACS effects persisted during motor imagery, a cognitive task which desynchronizes the rolandic 20 Hz rhythm of quiescent motor areas, thereby becoming theoretically less susceptible to resonance effects of beta stimulation. Eighteen fully healthy right-handed volunteers (8 females, 10 males; mean age 32.2 ± 7.05 years)underwent fourteen different randomized conditions. Both for motor imagery and for resting condition, a "basal 1" session (without tACS), tACS on the left motor cortex at 5 Hz (θ band), 10 Hz (α band), 20 Hz (β band), 40 Hz (γ band), as well as 20 Hz on the right parietal cortex (as a control for unspecific effects on cortical excitability) and a "basal 2" session (again without tACS), were run. Each session of stimulation lasted 1.5-2 minutes. TMS was applied over the sponge electrode used for tACS overlying the left M1. Corticospinal excitability changes during stimulation at different frequencies were indexed by motor evoked potentials (MEPs) through navigated transcranial magnetic stimulation (TMS) of the primary motor cortex. MEPs were recorded from the right First Dorsal Interosseus. For motor imagery tasks, subjects were requested to visually imagine a thumb-index finger pinch grip with their right hand. Each TMS pulse was delivered 1-2 seconds after the initiation of the motor imagery task as well as for rest condition. bA repeated measures ANOVA (factors motor imagery and rest x frequency conditions) showed that the maximal increase of corticospinal excitability took place when tACS was applied at 5 Hz with subjects engaged in a motor imagery task, whereas tACS at 20 Hz confirmed the maximal increase of corticospinal excitability with subjects at rest. On one hand results confirmed the frequency-dependence effects of tACS. On the other hand a state-dependent effect of tACS emerged for the first time. The entrainment in the theta range during

motor imagery might reflect reinforcement of working memory processes required to mentally elaborate and "execute" the task. We infer that tACS induces an entrainment effect by dragging the endogenous oscillatory activity to the one induced by stimulation. This indicates that human brain motor processes might be driven and promoted by application of external sinusoidal electrical forces.

TMS-evoked potentials after low-frequency rTMS: a premilinary study

Casula E.P. [1] **- Tarantino V.** [1] **- Cecotti F.** [2] **- Basso D.** [3]
Toffolo G.M. [2] **- Bisiacchi P.S.** [1]

[1] *Department of General Psychology, University of Padua, Padua, Italy*

[2] *Department of Information Engineering, University of Padua, Padua, Italy*

[3] *Faculty of Education, Free University of Bozen, Bozen, Italy*

Many studies have supported the idea that low-frequency repetitive transcranial magnetic stimulation (i.e. rTMS < 1-Hz) produces a decrement in motor cortex excitability, as revealed by motor-evoked potentials (MEPs). Nevertheless, findings often show contrasting outcomes. Currently, the development of TMS-compatible EEG systems offers an valuable tool for directly investigating the effects of TMS on cerebral cortex by analyzing TMS-evoked potentials (TEPs). The objective of our study was to directly evaluate the effect of a 1-Hz rTMS protocol on cortical excitability by analyzing the modulation of TEPs at rest. Repetitive TMS was carried out using a biphasic magnetic stimulator with a figure-of-eight coil. The EEG signal was acquired by a TMS-compatible amplifier from an array of 30 Ag pellet electrodes mounted in an elastic cap. Eight healthy volunteers underwent an rTMS protocol of 20 min consisting of a train of pulses at 1 Hz, delivered over left primary motor cortex (M1). The protocol intensity was set at 90% of participant's motor threshold (MT). To assess the protocol effects on TEPs, 50 TMS single-pulses at 100% of MT were delivered over M1, before (pre-rTMS session) and immediately after (post-rTMS session) the 1-Hz protocol. During the entire rTMS protocol participants were seated in a comfortable armchair in front of a computer monitor at 80 cm of distance. During the pre- and post-rTMS sessions, they were asked to fix a white cross in the middle of a black screen and to wear ear plugs playing white noise, in order to mask the coil click and avoid possible auditory ERP responses. The analysis of TEPs revealed differences in morphology and amplitude between the pre- and post-rTMS sessions. Early TEP components (such as P13, N18, P30, N45, and P60) were higher in amplitude in the post- compared to the pre-rTMS session. Furthermore, N100 was larger at central site Cz in the post- compared to the pre-rTMS session. Interestingly, such modulations were maximum at electrodes close to the stimulation site. The results confirm the inhibitory nature of N100 as shown by its increment in amplitude after the low-frequency rTMS protocol. Although preliminary, this study provides important insights into the effect of the TMS frequency on cortical excitability.

Neurological and neuropsychological changes induced in 8 right lesion motor stroke by controlesional motor cortex inhibitory rTMS

Caglio M. [1] **- Caroppo P.** [1] **- D'Agata F.** [1] **- Croce M.** [1] **- Salvatore E.** [1]
Craviotto G. [1] **- Campagnoli M.** [2] **- Orsi L.** [1] **- Pinessi L.** [1] **- Mortara P.** [1]

[1] *Neuroscience Department, AOU San Giovanni Battista, Turin, Italy*

[2] *Rehabilitation, AOU San Giovanni Battista, Turin, Italy*

Some studies are reported in the literature assessing the neurological and clinical amelioration after a rehabilitation treatment with repetitive transcranial magnetic stimulation (rTMS) in stroke patients. The most treated deficit are motor impairment, aphasia and neglect. The two most used protocols consist in the high frequency excitatory stimulation of the lesioned hemisphere and in the low frequency inhibitory stimulation of the unharmed hemisphere. The rational of the procedure is rebalancing the interhemisphere equilibrium altered by the stroke. The beneficial effects, from a clinical and neurological point of view, could be mild to medium, especially in a portion of patients. We hypothesized that the treatment could also affect neuropsychological scores of cognitive functions more lateralized in one hemisphere. Eight patients (2/6 males/females, age 51 ± 10 y, education 11 ± 6 y) with chronic right motor lesions (> 6 months poststroke) were enrolled for this study. Patients received 10 daily sessions of low frequency 1 Hz rTMS, 80% rest motor threshold, over the intact motor cortex with a focal 8 shaped coil (MAG&more, München). Outcome measures included dexterity, force, spasticity, objective neurological examination and a large battery of neuropsychological and psyschological test including: MMSE, Forward and Backward Digit Span, Corsi Span, Attentional Matrices, Short Story, Phonemic Fluency, Rey-Osterrieth Complex Figure Copy and Delayed Recall, Figures Copy, Bisection Lines Test, Landmark Task, Nelson Modified Card Sorting Test, Diller Letter Cancellation Test, SF36 Quality of Life, Hamilton Depression Inventory. The complete assessment was performed two weeks before rTMS and again two weeks after the end of treatment. We compared the scores with a two sample paired t-test ($p < 005$). Small to mild improvements were detected in some clinical outcome measures (spasticity, strength), three patients showed a greater improvement. Only Phonemic Fluency, Landmark Task and Line Bisection Test showed a significant improvement in the post treatment assessment. Depression and quality of like did not change except for Physical Role Subscale of the SF36. Our findings indicate that inhibitory rTMS effected the interhemispheric balance influencing and improving the neuropsychological scores of the more lateralized functions (language and space perception). This effect was particularly intriguing as we stimulated only the unharmed motor cortex with a focal coil and we did not treat directly areas specialized in the functions as in tradition rehabilitation protocols for aphasia or neglect.

Low frequency rTMS effect over the right dorsolateral prefrontal cortex in Depression resistant patients: effects on affective symptoms, cognitive function and P300 components

Picchi A. [1] **- Grassi G.** [1] **- Borsi M.** [2] **- Cossu C.** [2] **- Ferrari G.** [1]
Carrai R. [2] **- Zanasi M.** [1] **- Pinto F.** [2] **- Pallanti S.** [1] **- Grippo A.** [2]

[1] *SOD Psichiatria AOU Careggi, Florence, Italy*

[2] *SOD Neurofisiopatologia AOU Careggi, Florence, Italy*

Treatment-resistant depression (TRD) is a major health problem, affecting up to 15-20% of people with Major Depression. Between new therapeutical tools for these patients TMS is an emergent neurostimulation technique. While antidepressant efficacy of rTMS over DLPFC has been assessed in different clinical studies, less data are available on the effects on cognitive functions. The aims of the present study are to confirm the precedent findings about the antidepressant effects, to study the neurocognitive modification after 15 rTMS sessions after the right DLPFC, and to evaluate the possible role of the Event-Related Potential P300 as an indicator of the therapeutical response. Nine patients (age 41-76) diagnosed with Unipolar or Bipolar Depression resistant to at least two antidepressant trials, received low-frequency rTMS (1 Hz) over the right dorsolateral prefrontal cortex (DLPFC) in a 3-week trial (fifteen daily session, 1800 stimuli every session). Hamilton Depression, Hamilton Anxiety, Montgomery-Asberg Depression Scale, were evaluated the day before the treatment and every 5 session of rTMS. Trial Making Test, Stroop Test, Rey Auditory Verbal Learning Test, Rey Complex Figure Test, Verbal Fluency Test were evaluated in each subject at the beginning and at the end of the treatment. ERP were elicide by an acustic oddball paradigm with 20% target stimulus (red ash of light) and 80% non-target stimulus At the beginning and the end of the rTMS treatment auditory ERP was recorded before and immediately after the daily session of rTMS. After 15 rTMS sessions there was a significative reduction of HAM-D (76.46%), MADRS (80.33%), HAM-A (74.80%) scores. Looking at these results six patients were considered as remitters (HAM < 9). The neurocognitive test showed a significative improvement only in the Rey Auditory Verbal Learning Test (RAVLT), after the treatment there was a mean improvement of 10.16 points (immediate recall). This was seen not to be significantly linked to the antidepressant effect of rTMS. The latency of P300 was significantly increased at the beginning of the treatment (60% of patients had a P300 latency longer than the attended value for age) and remained increased at the end of the rTMS treatment. Considering the acute effect of rTMS, whereas at the day 1 no change of latency have been induced by 30 minutes of 1 Hz rTMS, at the day 15 rTMS determined a significant increase of P300 latency. The main finding of our study was: a dissociated effect of rTMS on affective symptoms

compared to cognitive symptoms. Central dopaminergic system play an important role in the generation of the P300 and that central dopaminergic activity could be involved in the modulation of P300 parameters. Our finding in depressed patients responders to rTMS treatment (increase in latency induced by rTMS effect on ERP responses at the end of treatment) can be explained as an indicators of functional restoring of the central dopaminergic system in the in the modulation of P300 parameters.

Time-course of transcranial direct current stimulation and multiparametric evaluation: a safety online TMS/tDCS combined study

Santarnecchi E. - Feurra M. - Barneschi F. - Cioncoloni D. Bianco G. - Rossi A. - Rossi S.

Department of Neuroscience, Neurology and Clinical Neurophysiology Section, University of Siena, Siena, Italy

Most of neurophysiological studies demonstrated the effectiveness of tDCS stimulation in modifying cortical excitability,as an off-line protocol. Just a handful of studies documented online effects. Moreover, relationships between cortical excitability changes and vital parameters are still underinvestigated. We monitored tDCS online and after-effects by adopting a novel online transcranial magnetic stimulation (TMS)/tDCS combined protocol, by recording motor evoked potentials (MEPs) prior, during and after tDCS. Simultaneously, vital parameters such as continuous heart rate (HR) monitored in beat per minute (bpm), systolic (sBP) and diastolic (dBP) blood pressures, sympathetic andparasympathetic tones (power spectra analysis of the R-R interval [RRI]) and the heart rate variability (HRV) were measured by using the "Task Force Monitor" device, in order to check whether monopolartDCS may cause potentially dangerous side effects induced by currents spreading through the brainstem. Neurophysiological and vital parameters were recorded in ten healthy subjects. A monopolart DCS montage was adopted by placing the target electrode over the dominant primary motor cortex (M1) and the reference over the ipsilateral shoulder. TMS was applied over the sponge electrode overlying the left M1 and MEPs were recorded from the right first dorsal interosseus (FDI). Ten MEPs were collected every 2.5 minutes time windows. The experimental design was set up by running a no-tDCS condition for 15 minutes and subsequently online tDCS (anodal, cathodal or sham) for additional 15 minutes. tDCS after effects were recorded for 30 minutes post-stimulation. Vital parameters were measured in 5 minutes time windows during the entire experiment, which lasted 60 minutes. Results showed a robust inhibition of cortical excitability induced by cathodal tDCS,occurring starting after 15 minutes online stimulation and persisting during the whole post-stimulation time-windows. Anodal tDCS induced just a slight effect between no-tDCS and post stimulation time windows.. Sham stimulation was uneffective. Analysis of vital parameters did not show significant differences across tDCS conditions. These findings provide new insights on the time course of tDCS effects, both on cortical excitability and safety parameters.

Effects of the low frequency rTMS over the right dorso-lateral prefrontal cortex on contingent negative variation

Mannarelli D. [1] **- Pauletti C.** [1] **- Grippo A.** [2, 3] **- Gori B.** [2] **- Agugliaro V.** [2] **Locuratolo N.** [1] **- De Lucia M.C.** [1] **- Fattapposta F.** [1]

[1] *Department of Neurology and Psychiatry, Sapienza University of Rome, Rome, Italy*

[2] *Department of Neuroscience, AOU Careggi, Florence, Italy*

[3] *IRCCS Fondazione Don Carlo Gnocchi, Florence, Italy*

The contingent negative variation (CNV) is a slow negative cortical potential related to the attentional effort that occurs between two contingent stimuli, a warning stimulus followed by an imperative stimulus and reflects operant conditioning processes. To test the effects of the modulation induced by low frequency repetitive transcranial magnetic stimulation (rTMS) of dorso-lateral-prefrontal cortex (DLPFC) on the CNV with a motor response. 9 right handed healthy subjects (mean age 23.67 ± 3.31 years), that were naive to the rTMS, underwent, in the same day, three consecutive EEG recordings during which CNV with motor response was evocated in basal condition and after 30 minutes of real or sham 1 Hz rTMS stimulation of the right DLPFC. For the sham stimulation we positioned the coil at 90º over the scalp, in the same place where we put the coil for the real stimulation. The order of real and sham stimulation was randomized using http/random.org. Total CNV amplitude and the areas in three different temporal windows (W1, W2, W3) were evaluated. Reaction times (RTs) were also measured for all CNV recordings. Results showed that 30 min of 1 Hz rTMS induced a significant decrease of total CNV amplitude ($Fz\ p < 0.03$ – $Cz\ p < 0.08$ – $Pz\ p < 0.03$), W1-CNV ($Fz\ p < 0.009$) and W2-CNV areas ($Fz\ p < 0.02$ – $Cz\ p < 0.02$ – $Pz\ p < 0.01$) respect to CNV in basal and sham conditions. No differences were found between basal and sham condition for all CNV characteristics. No difference was found in RTs for all recordings. This study confirms and extends that 1 Hz rTMS produces a real inhibitory effect on neurophysiological parameters as CNV. Transient inhibition of DLPFC could cause a difficulty in sustaining attention during a task of operative conditioning with a critical involvement of orienting and operative choice phases.

Is transcranial alternating current stimulation effective in modulating brain oscillations?

Mauri P. [1] **- Brignani D.** [1] **- Ruzzoli M.** [2] **- Miniussi C.** [1, 3]

[1] *Cognitive Neuroscience Section, IRCCS Centro San Giovanni di Dio Fatebenefratelli, Brescia, Italy*

[2] *Department de Tecnologies de la Informació i les Comunicacions, Universitat Pompeu Fabra, Barcelona, Spain*

[3] *Department of Biomedical Sciences and Biotechnology, National Institute of Neuroscience, University of Brescia, Italy*

Transcranial alternating current stimulation (tACS) is a promising tool to modulate brain oscillations, especially regarding possible therapeutic interventions. However, the lack of conclusive evidence for tACS to be able to effectively affect cortical activity still limits its application. The present study aimed at addressing this issue, exploiting on the well-known inhibitory alpha rhythm at posterior parietal cortex in visual perception and attention orientation. Ninety-six healthy volunteers (48 female, mean age 21.7) participated in the study and were randomly assigned to one of four groups of stimulation, each one composed by 24 participants. Each group was tested during a visual stimulus detection (yes/no) and orientation discrimination (leftward/rightward) task. Target stimuli were low-contrast gabor patches at five different contrast levels ranging from 0.034 to 0.052 (Michelson Contrast Index) presented in a random order in the left or right visual hemifield. The central contrast was adjusted at the threshold level estimated in a pilot experiment. All the participants were tested at the baseline and at a selective frequency of tACS, including Sham, 6, 10, and 25 Hz. A small target electrode (16 cm^2) was placed, according to the participant group, over the left or right occipito-parietal areas (PO7 or PO8) as determined by the International 10-20 EEG system. The reference electrode was positioned over the vertex CZ. The results, in terms of arcsine-transformed accuracy (% of correct responses), showed a general decrease of visual perception, over both the visual fields, independently by the site of stimulation (ipsilateral vs. contralateral), and this was found in the groups stimulated both at 10 Hz and at 6 Hz. The lack of retinotopically organized effects and the only marginal frequency-specificity force us to be cautious about the effectiveness of tACS to modulate brain oscillations. In conclusion, the present study does not provide strong evidence that tACS induces modulation of occipital brain oscillations during a visual task.

Impact of low frequency repetitive transcranial magnetic stimulation over right DLPFC on event-related brain potential

Zanasi M. [1] **- Grassi G.** [1] **- Borsi M.** [2] **- Carrai R.** [2] **- Picchi A.** [1]
Pinto F. [2] **- Pallanti S.** [1] **- Grippo A.** [2]

[1] *SOD Psichiatria AOU Careggi, Florence, Italy*

[2] *SOD Neurofisiopatologia AOU Careggi, Florence, Italy*

The utility of rTMS technology in the treatment of depression is fully recognized from a lot of studies, but only in the 30% of patients the therapy is effective. Many studies have already demonstrated the connection between effectiveness of rTMS and elder age, drug resistance or presence of comorbidities, but they didn't found a useful link with a neurophysiological marker. Some studies controlled the influence of rTMS over DLPFC on P300 wave in depressed patients, but not in healthy subjects. So our objective is to better understand this last relationship to predict how much useful will be the rTMS for every patient before starting the therapy, so it will be easier to identify who receives more benefits from the treatment. Up to now in the studies was generally stimulated the left DLPFC. Pallanti et al showed similar effect of 1 Hz rTMS on right DLPFC. We studied a population of 9 healthy young volunteers, right-handed with no history of neurological or psychiatric diseases. In particular, all subjects with a history of affective, psychotic, or cognitive disorders were excluded. ERP were elicited by an acoustic oddball paradigm with 20% target stimulus and 80% non-target stimulus All subject were naive to the rTMS. Every subject was recorded twice in one week, once using real rTMS (1 Hz) over the right DLPFC and another time using sham stimuli. For the sham we positioned the coil at 90º over the scalp, in the same place where we put the coil for the real stimulus. The order of real and sham stimuli was randomized using http/random.org. We compared the P300 wave latency and amplitudes before and after the real and sham stimulation. Results showed that 30 min of 1 Hz rTMS OVER RIGHT DLPFC induced a significant increase of P300 latency. There was no effect for early ERP components (N100, P200 and N200). We show effect on P300 amplitude only at Pz electrode. Reaction time showed no significant main effect of rTMS. It is generally admitted that cortical excitation is induced by high frequency rTMS (i.e. 20 Hz), whereas cortical inhibition is provoked by low frequency (i.e. 1 Hz). However, several studies did not report any modification after 1 Hz rTMS on cognitive functions. This study confirms and extends that 1 Hz rTMS produces a real inhibitory effect on Neurophysiological parameters – i.e. P300 latency and amplitude. The data suggest that unilateral rTMS modifies the speed of cognitive processing and in only in part the energetical aspect of information processing, and that cortical inhibition induced by the magnetic stimulation affects principally the controlled cognitive processes and not the automatic ones.

Independent component analysis of the neural correlates of action awareness

Arrighi P. [1] **- Sotgiu E.** [2] **- Borelli L.** [2] **- Bonfiglio L.** [1] **- Carboncini M.** [1] **Cantore N.** [1] **- Rossi B.** [1] **- Frisoli A.** [2] **- Andre P.** [3]

[1] *Neurorehabilitation Unit, University of Pisa, Pisa, Italy*

[2] *PERCRO Laboratory, TECIP, Scuola Superiore Sant'Anna, Pisa, Italy*

[3] *Department of Physiology, University of Siena, Siena, Italy*

It is assumed that while performing a goal-oriented movement a matching process occurs between its predicted and actual sensory consequences that may contribute to the feeling of ourself as the agent of our's own actions, that is the "sense of agency". If the matching process detects a discrepancy which exceeds a certain threshold then awareness of action discrepancy or a perturbed sense of agency appears. In a previous study we demonstrated that both these perceptions are associated with changes in movement-related high α/low β desynchronization in the parietal cortex. To localize the source/s of such desynchronization we used independent component analysis (ICA) computed on 64 channel EEG recordings of normal subjects performing center-out cued reaching movements under a variable degree of perturbation of the visual feedback. Briefly, the output of an electromagnetic motion-tracking system, whose sensor was located on the subject right finger, was processed by a computer and projected on a mirror where the subjects saw their virtual finger as a cursor, having their hand hidden by the mirror. Computer processing used an algorithm for adding a linear directional bias in clockwise/counterclockwise direction of varying amplitude or for producing a randomly-generated distortion (d). Thus, four experimental conditions were presented pseudorandomly: 0°d, visual displacement of 7.5° or 18°, which were under or above the threshold for conscious detection, respectively, and no correspondence between the actual and the seen movement (other's). After each movement subjects reported whether they felt like to be in control or out of control of the movement viewed and, in the former case, whether feedback was congruent or distorted with respect to their actual movement. As expected, a discrepancy was detected in 4 ± 3%, 23 ± 15%, 79 ± 11% and 100% of 0°d, 7.5°d, 18°d and other's movements, respectively. Time-frequency analysis computed on the activity of two clusters of ICs located in the mesial portion of precuneus and in the right angular gyrus demonstrated that movement-related α3 and β1 desynchronization was significantly higher in 18°d as compared to 0° and 7.5°d conditions. In case of altered sense of agency (other's), desynchronization in the same frequency bands was similar to that associated with 18°d in the first 500 ms since the exit from the starting point, then it partially recovered towards pre-movement values although movement was still ongoing. We speculate that during distortion the computational cost needed to incorporate/select afferent signals such as the incongruent visual and the veridical proprioceptive signals in the monitoring/matching process leads to an

increase of movement-related α3 and β1 desynchronization at the level of precuneus and right angular gyrus. According to this speculation, a reduced need of monitoring, which occurs when subjects became aware that visual feedback is not related to their own movement, is associated with a partial recover of α/β rhythms in these brain areas.

Neuropsychological Trends

12
November 2012

2nd Global Congress
for Qualitative Health Research

ENGAGING PEOPLE IN HEALTH PROMOTION & WELL BEING

News opportunities and challenges for qualitative research

Selected papers

June, 28-30 2012

Catholic University of Sacreted Heart of Milan
Milan - Italy

The multiple interviewing paths of qualitative health research: what opportunities for neurosciences?

Claudio A. Bosio - Guendalina Graffigna
Michela Balconi

Faculty of Psychology, Catholic University of Sacreted Heart of Milan, Milan, Italy

guendalina.graffigna@unicatt.it

Qualitative research has for long viewed health as an area of primary interest in which to test its capacity to identify new research topics, to develop theoretical paradigms and methods of inquiry, and to generate applications important for individuals and society (Pope, 1995; Jones, 1995; Grypdonck, 2006; Bosio, 2012). The richness of the results produced is well known and documented (Morse, 2007; Morse, 2010), and it has been confirmed by the remarkable variety of papers presented at the 2nd Global Congress for Qualitative Health Research recently hosted at the Catholic University of Sacreted Heart of Milan (Italy), 28th-30th of June 2012, of which we will present here a selection.

The reasons which foster this richness of possible applications and methodological solutions of qualitative health research (QHR) can be tracked in several factors.

The first seems to be the well documented ability of QHR to intercept and face problems aroused in the real social context. This is also linked to the applicative nature of qualitative research, which main goal – from the beginning of its epistemological and methodological roots (Glaser & Strauss, 1967) – is to be able not only to cast light on real and up-to-date issues that need to be dealt; but in particular to produce "usable knowledge" able to sustain intervention and to produce change.

The second reason appears to be structural and internal to QHR discipline (Bosio & Graffigna, 2012): namely linked to the plurality of theoretical and methodological options ascribable to QHR tradition. In particular the multiplicity of interlacement and combination paths among these options valorizes QHR: interlacements that allow a great flexibility and creativity of

the research design; that make it "ecological" and best suitable to explore real social problems (Richards & Morse, 2007; Bosio, Graffigna & Scaratti, 2012).

The third reason relates to QHR ability to dialogue and collaborate with epistemological and methodological traditions apparently and historically far-a-way, but all sharing the same attention to real issues linked to health (e.g. medicine, public health, nursing, neuropsychology, agriculture, engineering). This lively ability to be open to change and debate, to reorient its practice and to invent new ones in order to build bridge between different research communities appear crucial and it is testified both in the literature (Mayan, 2009) as well as in the practice.

As a matter of fact the ongoing vitality and continuous change of the healthcare domain – exemplify for instance from the revision of medicine paradigms in favor of psycho-socio-cultural dimensions of *care & cure*, as well as from the post-modern processes of healthcare organizations reconfigurations (Bosio, Graffigna & Scaratti 2012; Graffigna, Libreri & Bosio 2012) – require reflection on the appropriateness of traditional research approaches and claims for innovation of methodological paradigms. Thus, at present research perspectives able to bridge different contexts of knowledge and to offer a multifaceted glance on health phenomena are more and more needed. In this frame, qualitative research is receiving an increasing attention, not only as a suitable approach to explore various health issues, but as a possible component of mixed and multi-disciplinary research design. The crossing of research interests and scope between neuropsychological traditions and qualitative methods – as testified in this issue – is only one of the possible collaborative examples in this direction. The proficient joint action between these two domains elucidates the crossing role of the qualitative and quantitative methods viewed as a scientific paradigmatic way to approach health. In this respect, neuropsychology may furnishes a valid test field to verify the *sustainability* of qualitative practices and the *usability* of quantitative methods, which, taken together, allow to reconstruct the compound picture of "to be how" and "to intervene how" for *care & cure*.

In this special section we exemplify only a few possible directions of the interlacement between qualitative research and other epistemological disciplines and methodological traditions in the health domain: our aim is to testify the potentialities of these experiences in increasing research ability to intercept and read health issues and to produce usable knowledge to generate change and innovation in *care & cure* interventions. More into details:

- The paper of Sozzi and Balconi and the paper of Pett and Clark, discuss the continuity and discontinuity of qualitative and quantitative methodological traditions in health research and witness the potentiality of interlacing them in a productive and applicative dialogue.

- The paper of Leone et al. as well as the paper of Bellardita et al. exemplify the ability of qualitative research to read the intangible aspects of the *care & cure* relationship and to explore expert and lay knowledge and meaning making processes intertwines and mismatches, in particular in challenging situation as the care of end of life or as the treatment of prostate cancer.
- The paper of Masako et al. and the paper of Libreri and Graffigna testify the ability of qualitative research to allow an "ecological" and situated glance at the phenomena under investigation, which can be studied during their development.
- The paper of Senes et al. and the paper of Alvarez et al. show how qualitative research can be considered not only a strategy to produce insights and new information regarding one given phenomenon; it can also become the privileged arena in which to develop new approaches and devices (i.e. healing garden practices for neurological rehabilitation; the development of new technological devices for nursing practices in Parkinson care) for the better management of *care & cure*.

Although very various in the objects explored and in the methodological definition of the adopted research design, these papers share some common ground:

- all researches described moved from a real social problem and they sought to find the best balance as possible between applicative dimension and sophistication of methods and research design;
- in all cases presented, qualitative research assumed an essential but not dominant role, as main support and counsellor of the whole research process, but often as not unique and autonomous (since often needing the synergy with other – quantitative – approaches). Furthermore qualitative research seemed able to qualify the all research process, enhancing it flexibility and its ductility in aim of a better resonance to the object of the study;
- finally all cases well testify the flexibility of possible qualitative research paths, enhancing the ecological power and creativity of all the research process.

The papers hosted in this special section suggest promising new kind of interlacement between qualitative research and other epistemological as well as methodological traditions in order to produce better usable knowledge and to better sustain change and intervention. Many other interlacement paths are possible, and many more can be invented and seek in the next future! However this special section well witnesses how the situated and engaging nature of qualitative research has the potential to transform research practices into the basis for learning and change in healthcare settings (Heller, 2004). As a matter of fact, qualitative research appears to be the best strategy with which to explore phenomena arising at the intersection among the evolving trends which are reconfiguring both the roles and subjectivity of individuals (i.e. the

role of patients, of their peer networks and of their lay social contexts) and *care & cure* organized practices (in the direction of enhanced complexity and fluidity). Moreover, the joint action with quantitative approach allows to refute a separation between methodologies and practices, in favor of the "best and more useful" for healthcare that points out the renovation of a systems of knowledge.

References

Bosio, A.C. (2012). Editoral. In: Graffigna, G., Morse, J.M., & Bosio, A.C. (eds.), *Engaging people in health promotion and well-being. New opportunities and challenges for qualitative research*. Milano: Vita & Pensiero.

Bosio, A.C., & Graffigna, G. (2012). "Issue-based research" and "process methodology": reflections on a postgraduate master's program in qualitative methods. *Psychology Learning and Teaching*, 11 (1), 52-59.

Bosio, A.C., Graffigna, G., & Scaratti, G. (2012). Knowing, learning and acting in health care organizations and services: challenges and opportunities for qualitative research. *Qualitative Research in Organization and Management*, 7 (3).

Glaser, B., & Strauss, A. (1967). Awareness contexts and social interaction. *American Sociological Rewiew*, 29, 669-679.

Graffigna, G., Libreri, C., & Bosio, A.C. (2012). Online exchanges among cancer patients and caregivers: constructing and sharing health knowledge about time. *Qualitative Research in Organizations and Management*, 7 (3).

Grypdonck, M.H.F. (2006). Qualitative health research in the era of evidence-based practice. *Qualitative Health Research*, 16, 1371-1385.

Heller, F. (2004). Action research and research action: a family of methods. In: Cassell, C., & Symon, G. (eds.), *Essential guide to qualitative methods in organizational research*. London: Sage, pp. 349-360.

Jones, J. (1995). Qualitative research: consensus methods for medical and health services research. *British Medical Journal*, 311-376.

Mayan, M.J. (2009). *Essentials in qualitative inquiry*. Walnut Creek, CA: Left Coast Press.

Morse, J.M. (2007). What is the domain of qualitative health research? *Qualitative Health Research*, 17, 715-717.

Morse, J.M. (2010). Editorial: two decades of qualitative health research. *Qualitative Health Research*, 20, 291-292.

Pope, C. (1995). Qualitative research: reaching the parts other methods cannot reach: an introduction to qualitative methods in health and health services research. *British Medical Journal*, 31, 42-45.

Richards, L., & Morse, J.M. (2007). Users guide for qualitative methods, 2nd ed. Thousand Oaks, CA: Sage.

Neuropsychological evaluation of visuo-spatial neglect. Is there a relation between quantitative and qualitative methods?

Matteo Sozzi [1] **- Michela Balconi** [2]

[1] *Department of Neuro Rehabilitative Sciences, Casa di Cura del Policlinico, Milan, Italy*

[2] *Laboratory of Cognitive Psychology, Catholic University of Sacreted Heart of Milan, Milan, Italy*

m.sozzi@ccppdezza.it

Abstract

Visuo-spatial neglect is one of the most frequent neuropsychological disorders after a brain damage. Clinical Neuropsychologists work everyday with persons with this specific attentional syndrome either for assessment and rehabilitation. Scientific literature provides a wide amount of instruments in particular for neuropsychological evaluation and most of them are based upon quantitative methodology, that is they are aimed to provide numerical values in order to assess neglect in terms of impairment. On the other hand, very few instruments lead to an evaluation of neglect in terms of disability. In this work we want to provide a brief description of the most used tests arguing for a relation between quantitative methods, as assessment of impairment, and qualitative methods, as instruments for disability. Finally, we give some suggestions, on the base of our experience, to enforce qualitative methodology in neglect assessment.

Keywords: Neglect; Neuropsychological evaluation; Qualitative methods; Impairment; Disability

1. Introduction

Unilateral spatial neglect is an attentional deficit following a brain lesion. This complex neuropsychological syndrome consists of different signs which have in common the tendency to ignore contralesional space. It is basically

characterized by deficits in exploring, keeping attention either perceive and act in a part of the space (Halligan & Marshall, 1991).

Symptomatology is extremely variable. Firstly it may depends on time from brain damage onset and its severity as well; thus at a bed side examination one could observe a patient with ipsilesional deviation of head and gaze; lack of responses if a speaking person stands on the left; moreover, still in case of presence of two examiners, the patient may provide response only to the examiner which stands on ipsilesional side, even if there is no match between voice and gender of examiner. At a daily life observation patient could eat only in half of the plate; they do not catch objects if put on their contralesional side; they dress only right part of the body; finally it is generally observed that neglect patients show anosognosia, that is a reduced, even absent, awareness of the pathology (Stone et al., 1991).

Secondly, neuropsychological evidences for dissociation between levels of space involved in neglect were found: such as personal, peripersonal, extrapersonal, representational space (Ladavas et al., 1997).

In case of personal neglect a reduced awareness of contralateral half-body is observed and in particular deficits in exploring half part of the body, difficulties in dressing, shaving, washing, making-up, hair-brushing; besides, psychiatric symptoms may occur such as somatoparaphrenia which is an illusional belief concerning left arm, or misoplegia intended as aggressiveness and auto-direct damaging actions on the contralesional arm.

In case of peri-personal neglect, patients show difficulties in detecting stimuli, reaching or perceiving contralateral objects in the space delimited by the width of arm movements. Whilst extra-personal neglect consists in visuo-spatial deficits concerning the surrounding space over the limit of arm movements; in case of extra-personal neglect, severity could be enhanced by the presence of hemianopia.

Thirdly neglect may be space- or object-centred, referring to an egocentric or object-centred reference frame.

Neglect generally occurs after a right brain lesion, involving in particular the temporo-parietal area and the inferior parietal lobule (Vallar, 2001) even thought it is possibile to find neglect signs in left brain damaged patients as well. Different works tried to report an incidence of neglect after right brain lesion and data vary from 10% (Vanier et al., 1990) to 82% (Stone et al., 1993); studies on patients with left brain lesions show an extremely variable of percentage: Beis and coworkers (2004) report an occurrence between 0 and 76%; whilst other studies like those one of Halligan et al. (1993), found an incidence of 15% and other again an occurrence of 65% (Stone et al., 1993). These variations could be caused by different reasons: on one hand it may depends by different sensitivity of tests; on the other hand by

the time between lesion and evaluation (Plummer et al., 2003). Concerning right neglect (that is in presence of a left brain lesion) it may be possible that symptoms are sometimes underestimated because of the task: in many occasion left brain damaged patient could presents aphasia as well and for this reason execution of visuo-spatial test may be affected either for comprehension of instructions and for use of verbal stimuli; the whole of these limits could have indirectly determined a lower percentage of incidence of neglect for left brain demaged patients and a poorer description of specificity of this syndrome (Berndt et al., 2005; Kleinman et al., 2007).

Besides the location of misattention (left vs right) or the specificity of the syndrome, Neglect is described by scientific literature mainly as an *impairment* involving either visuo-spatial attention, arm movements, and gaze exploration in different degree of severity.

Differently, both rehabilitation outcomes and daily life activities recall to the wider concept of *disability*.

In 1980 the World Health Organization, in its *International Classification of Impairment, Disability and Handicap*, states that IMPAIRMENT should be considered as any loss or abnormality of psychological, physiological, or anatomical structure or function in the context of health experience; whilst DISABILITY is any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being.

Thus in case of a particular *disease* (e.g. cerebral stroke), the consequent *impairment* could be Neglect and the *disability* the visuo-spatial attentive deficits.

Disability deriving from neglect may generally affect the possibility to find things in the surrounding space, or in addition to other characteristics of patients (e.g. age) it can have significant influences on outcome rehabilitation (Sozzi et al., 2012).

Which measures could provide information on disability deriving from neglect? Is it possibile to find a link between quantitative and qualitative measure of neglect?

The aim of this work is to provide a review of the more frequently used instruments in the assessment procedures to study neglect, give a short description of them and, highlight a possible interaction between different methods of assessment.

2. Assessment methods

Neglect could be assessed and monitored by means of two different types of tools: quantitative and qualitative methods. The first mainly concerns neuropsychological assessment and it is characterized by the use of tasks which can vary in type and difficulties: paper-and-pencil tasks as well as computerized tests. All of them are aimed to highlight impairment and provide a numerical measure by which having information on the specificity of neglect (e.g. peri-personal vs personal one) and at the same time the severity of the syndrome. The second method is based on the clinical observation of the patient in order to have a feedback concerning the disability caused by neglect syndrome.

2.1. Quantitative methods

An example of the most known neuropsychological tests used in neglect assessment includes these instruments:

- Line bisection (e.g. Schenkenberg et al., 1980). There are different versions of the same test which basically consists in asking the patient to bisect a line putting a mark where the exact midpoint is perceived. It is generally found that neglect patients show a rightward bias and consequently mark the midpoint closer to the right extremity.
- Cancellation tasks (Albert, 1973; Gauthier et al., 1989). Line cancellation is a widely use test in neglect assessment; a series of lines with different orientation are distributed on all the space of a paper sheet and the patient is asked to cancel all of them. Patients with a severe neglect generally omit to find the lines put on contralesional extremity. The sensitivity of this test mainly allows detecting severe neglect and this is mainly due because of the possibility to gradually move the focus of attention from right to left in absence of any distractor. Other cancellation tests consider the presence of distractors which determine a higher difficulty of task. With Bell cancellation test, for example, the patient is asked to find all targets (shapes of bells) which are between several other shapes of different objects. In star cancellation patient should be able to find star with the dimension indicated by the examiner; the target are between other stimuli such as stars with different dimensions and letters. In Letter cancellation test patient is asked to find all the H letters; all letters are written on six different lines.
- Drawing test (Spinnler & Tognoni, 1987; Halligan et al., 1991; Agrell et al., 1997). As for the previous tests, it is likely to find different versions of this task: in general, patients are asked to copy geometric figures or com-

plex drawing designs, they may either asked to spontaneously draw different figures (clock, human silhouette, butterfly, etc.).
- Word and Sentence reading. The patient is asked to read word and sentences: the aim of this test is to find the presence of neglect dyslexia and its severity.
- Raven 1947, PCM position preference (Colombo et al., 1976). These authors proposed a different version of the test very frequently used for executive functions and reasoning abilities. Patient is asked to find the "most correct" solution to be put in the uncompleted matrices; at the end of the test a Position Preference Index is calculated as difference between the number of "right" responses (i.e. solutions 3 and 6) and the number of "left" ones (solutions 1 and 4), if the obtained value is higher than 8 one should consider the presence of a position preference related to an attentional bias which is on turn determined by the presence of neglect. It was found to be a sensitive measure of the presence of neglect, either for left and right heminattention (Strauss et al., 2006).
- BIT (Wilson et al., 1987). It is one of the most widely used test battery to assess neglect; the BIT consists of a series of paper-and-pencil like letter and star cancellation, figure copying, line bisection and free drawing. It provides scores that clearly define the severity of neglect basing upon patient's performance.

Apart from these paper-and-pencil tests, it possible to find in addition some computerized procedures aimed to observe more precisely reaction times, accuracy and other variable such as eye-movements in neglect patients. An example is provided by our work (Balconi et al., 2012a; 2012b) in which we administered a modified version of bisection task. Stimuli were horizontal gaps represented by two red spheres and patients were asked to bisect the virtual space between these two endpoints. Segment length and its spatial position were monitored, in order to verify the consistency of rightward bias increasing as a function of left-side dislocation; moreover we monitored eye-movements as indirect measure of attention. We observed, as attended, a rightward bias increasing in function of segment length and spatial position and we additionally confirmed that eye-movement behavior is directly related to visuo-spatial scanning of space.

Another example of computerized assessment comes from Erez et al. (2009) who realized VISSTA (Visual Spatial Search Task). This instrument consists of two kinds of task in which patients are asked to search targets in different conditions: in the *feature search task* the patients have to find the target between distractors which vary only for color, whilst in *conjunction search task* the target is between different distractors which vary either for shape and color. For all of these two types of task different difficulty levels are presents.

As said before, all of these tasks provide a numerical value which gives information on several aspects of neglect, such as its specificity and severity as well. Nevertheless psychometric tests are a part of neuropsychological assessment: these results are in part integrated with clinical interview and clinical observation (which are part or the neuropsychological assessment as well) in order to have a detailed neuropsychological profile (*Table 1*).

2.2. Qualitative methods

In scientific literature only few works concern description of assessment scales based upon qualitative methods. We found two main contributes:

- Semi-structured scale for evaluation of hemi-inattention (Zoccolotti et al., 1991; 2012).
- This is a qualitative assessment based upon the observation of patients during activities; it is composed by a subscale for personal neglect and a scale for extrapersonal neglect. Patient is asked to execute behaviours such as hair-brushing, shaving, making-up or complex activities like serving tea or distribute cards.
- Catherine Bergego Scale (Azouvi et al., 2006). This is a scale based upon qualitative observation of the patient during activities of daily living; it consists in on direct patient observation on real life situation such as grooming, dressing, wheelchair driving etc. The scale provides a score between 0 (no neglect) and 30 (severe neglect). The authors found high correlation of the scores obtained by the scale with neuropsychological tests. These scales constitute a valid and effective integration of psychometric assessment in order to obtain a complete neuropsychological assessment (*Table 1*).

Table 1. Sample of neuropsychological tools for assessment of visuo-spatial neglect

Sample of neuropsychological tools for assessment of visuo-spatial neglect
Quantitative methods (measure of impairment): • Line bisection (e.g. Schenkenberg et al., 1980); • Cancellation tasks (Albert, 1973; Gauthier et al., 1989); • Drawing test (Spinnler & Tognoni, 1987; Halligan et al., 1991; Agrell et al., 1997); • Raven 1947, PCM position preference (Colombo et al., 1976); • BIT (Wilson et al., 1987); • Virtual bisection task (Balconi et al., 2012; 2012b); • VISSTA – Visual Spatial Search Task (Erez et al., 2009).
Qualitative methods (measure of disability): • Semi-structured scale for evaluation of hemi-inattention (Zoccolotti et al., 1991;1992); • Catherine Bergego Scale (Azouvi et al., 2006).

3. Discussion

Scientific literature shows an evident imbalance between quantitative and qualitative methods. At present there is a wide use of quantitative methods (e.g. neuropsychological tests) which are aimed to provide numerical values for a clear description of neglect, conceived as impairment.

Even thought not all the quantitative tests present a high level of validity neither seem to be totally sensitive in finding neglect (for a review see Plummer et al., 2003), they constitute an important tool for neuropsychological assessment. From these values we can obtain a great amount of information concerning either specificity of neglect and its severity. The more complex is the test, the more information they provide: firstly they could concern the level of space involved (e.g. personal; peripersonal or extrapersonal neglect); secondly the attentional bias frame (e.g. object-centred or space-centred neglect); finally all numerical data allow the planning of neuropsychological rehabilitation programs, thus, besides giving useful information, they constitute *per se* a base-line. Actually, after a rehabilitation program it is possible to verify the possible reduction of severity of neglect and, in turn, verify the effectiveness of the specific treatment adopted.

On the other hand it seems that only few instruments permit to have a qualitative assessment of neglect. In other words, there is a lack in assess neglect in term of disability. The scales we found allow the observation of patient during the execution of some activities of daily living. Even thought this could be an indirect measure of neglect consequences in everyday life of the patients, we should obtain some more information on patients' disability.

We then suggest to enforce clinical observation of the patients during daily activities. This procedure provides further information in addition to those obtained by quantitative assessment.

An example of this procedure could be done by patient observation during physiotherapy sessions: neuropsychologist should become a silent observer of the session and keep information firstly on the level of collaboration of the patient. He should observe how the patient behaves with the therapist: firstly in terms of collaboration, secondly if there are some behavior changes with respect to position assumed by the therapist or to physical exercices involving controlesional space. A part of that, the patient should be observed in selected moments of everyday activities during his hospitalization: for example, one should observe if he is able to move by himself in the hospital, and which limits he generally comes across.

All this information are than shared in the multidisciplinary team discussing about the main goals the patient should reach, the achieved targets and the problems and difficulties found by other practitioners in other contexts.

Moreover this qualitative methodology contributes to increase information in order to complete neuropsychological assessment together with psychometric tests and semi-structured scales.

Finally, in our experience this practice allows a more complete assessment of the single patient and, more in general, we argue that this could lead to a wider knowledge of neglect syndrome in terms of disability, concerned as reduction of abilities in patients' own environments.

References

Agrell, B.M., Behlin, O.I., & Dahlgren, C.J. (1997). Neglect in elderly stroke patients: a comparison of five tests. *Psychiatric Clinical Neuroscience*, 51, 295-300.

Albert, M.L. (1973). A simple test of visual neglect. *Neurology*, 23, 658-664.

Azouvi, P., Bartolomeo, P., Beis, J.M., Perennou, D., Pradat-Diehl, P., & Rousseaux, M. (2006). A battery of test for the quantitative assessment of unilateral neglect. *Restorative Neurology and Neuroscience*, 24 (4-6), 273-285.

Balconi, M., Sozzi, M., Ferrari, C., & Pisani, L. (2012a). Grasping and pointing task comparison in a hemineglect patient. Behavioural and eye-movement measures in an online bisection task. *European Journal of Neurology*, 19 (1), 458-807.

Balconi, M., Sozzi, M., Ferrari, C., Pisani, L., & Mariani, C. (2012b). Eye movements and bisection behavior in spatial neglect syndrome. Representational biases induced by the segment length and spatial dislocation of the stimulus. *Cognitive Processing*, 13 (1), 89-92.

Berndt, R.S., Haendinges, A.N., & Mitchum, C.C. (2005). Orthographic effects in the word substituitions of aphasic patients: an epidemic of right neglect dyslexia? *Brain and Language*, 93, 55-63.

Colombo, A., De Renzi, E., & Faglioni, P. (1976). The occurrence of visual neglect in patients with unilateral cerebral disease. *Cortex*, 12, 221-231.

Erez, A.B., Kaatz, N., Ring, H., & Soroker, N. (2009). Assessment of spatial neglect using computerised feature and conjuction visual search task. *Neuropsychological Rehabilitation*, 19 (5), 677-695.

Gauthier, L., Dehaut, F., & Joanette, Y. (1989). The bells test: a quantitative and qualitative test for visual neglect. *International Journal of Clinical Neuropsychology*, 11, 49-54.

Halligan, P.W., Cockburn, J., & Wilson, B.A. (1991). The behavioural assessment of visual neglect. *Neuropsychological Rehabilitation*, 1, 5-3.

Halligan, P.W., & Marshall, J.C. (1991). Left neglect for near but not far space in man. *Nature*, 350, 498-500.

Kleinman, J.T., Newhart, M., Davis, C., Heidler-Gary, J., Gottesma, R.F., & Hillis, A.E. (2007). Right hemispatial neglect: frequency and characterization following acute left hemisphere stroke. *Brain and Cognition*, 64 (1), 50-59.

Làdavas, E., Berti, A., Ruozzi, E., & Barboni, F. (1997). Neglect as a deficit determined by imbalance between multiple spatial representation. *Experimental Brain Research*, 116 (3), 493-500.

Plummer, P., Morris, M.E., & Dunai, J. (2003). Assessment of unilateral neglect. *Physical Theraphy*, 83, 732-740.

Schenkenberg, T., Bradford, D.C., & Aja, E.T. (1980). Line bisection and unilateral visual neglect in patients with neurologic impairment. *Neurology*, 30 (5), 509-517.

Sozzi, M., Balconi, M., Arangio, R., Pisani, L., & Mariani, C. (2012). Top-down strategy in rehabilitation of spatial neglect: how about age effect? *Cognitive Processing*, 13 (1), 339-342.

Spinnler, H., & Tognoni, G. (1987). Standardizzazione e taratura di test neuropsicologici. *The Italian Journal of Neurological Sciences*, 8 (6), 1-20.

Stone, S.P., Halligan, P.W., & Greenwood, R.J. (1993). The incidence of neglect phenomena and related disorders in patients with an acute right or left hemisphere stroke. *Age Aging*, 2, 46-52.

Stone, S.P., Wilson, B., Wroot, A., Halligan, P.W., Lange, L.S., Marshall, C.J., & Greenwood, R.J. (1991). The assessment ofvisuo-spatial neglect after acute stroke. *Journal of Neurology Neurosurgery and Psychiatry*, 54, 345-350.

Strauss, E., Sherman, E.M.S., & Spreen, O. (2006). *A compendium of neuropsychological tests: administration, norms and commentary*, 3rd ed. Oxford: Oxford University Press.

Vallar, G. (2001). Extrapersonal visual unilateral spatial neglect and its neuroanatomy. *Neuroimage*, 1 (2), S52-58.

Vanier, M., Gauthier, L., & Lambert, J. (1990). Evaluation of left visuospatial neglect: norms and discrimination power of two tests. *Neuropsychology*, 4, 87-96.

Wilson, B.A., Cockburn, J., & Halligan, P.W. (1987). *Behavioural Inattention Test*. Titchfield, Hants, England: Thames Valley Test Company Ltd.

World Health Organization (WHO) (1980). *International Classification of Impairments Disabilities and Handicaps*. Genève.

Zoccolotti, P., Antonucci, G., & Judica, A. (2012). Psychometric characteristics of two semi-structured scales for the functional evaluation of hemi-inattention in extrapersonal and personal space. *Neuropsychological Rehabilitation*, 2, 179-191.

Zoccolotti, P., & Judica, A. (1991). Functional evaluation of hemineglect by means of a semistructured scale: personal extrapersonal differentiation. *Neuropsychological Rehabilitation*, 1, 33-44.

Continuing conundrums in communication between qualitative and quantitative paradigms in health research

Marjorie A. Pett [1] **- Lauren C. Clark** [2]

[1] *MStat, DSW, University of Utah College of Nursing, Salt Lake City, Utah, USA*

[2] *RN, PhD, FAAn, University of Utah College of Nursing, Salt Lake City, Utah, USA*

marge.pett@nurs.utah.edu

Abstract

Despite concerted efforts, there remains a residue of shared spoken and unspoken prejudices from the qualitative-quantitative debates of the 1970's and 1980's. In this discussion, we examine both the source and content of these conundrums and posit the need for greater use of mixed methods research in the health sciences. An exemplar that has used mixed methods in health sciences research is presented.

Keywords: Quantitative vs. Qualitative paradigms; Mixed methods research

1. Introduction

Scientific inquiry in health equity research has primarily operated within the boundaries of two paradigms, or ways of viewing the world (Mendlinger & Cwikel, 2008): qualitative and quantitative. Cwikel (2006) has suggested that these paradigms can be thought of as lampposts under whose light we might search for lost keys. If this is the conceptual framework within which we choose to investigate, the light illuminates the type of answers we can find and how we find them. We fail to explore the unknown that lies outside the circle illuminated by the lamppost. The paradigm selected dictates the theories tested and the methods by which data are collected and analyzed.

One such world view, the qualitative paradigm inductively builds knowledge about the meaning of illness and health for the people we call patients in

the healthcare system. Those insights from patients can serve to direct healthcare interventions and increase empathy of healthcare providers. In contrast, the quantitative paradigm offers a mode of inquiry that can be used for deductive research, when the goal is to test theories or hypotheses, gather descriptive information, or examine relationships among variables. Such quantitative data have the potential to provide statistical evidence to begin to establish (probable) cause and effect about health, illness, and care modalities.

Together qualitative and quantitative paradigms can provide extremely useful insights into best practice approaches to health research programs. Yet, despite their many common goals, there continues to be gaps in communication between the faculty and students who learn and work together on qualitative and quantitative health studies.

What is the problem? This discussion of the methods' merits and drawbacks has gone on for more than 50 years, if not centuries (Johnson & Gray, 2010). The purpose of this article is to examine these continuing conundrums and to argue that purveyors of these contrasting and, at times, conflicting methodologies need to find shared space for civil discourse. It is only in this way that educators and students on both sides of this discussion can be "respectfully and dialectically engaged in dialogue toward enhanced, reframed, or new understandings" (Greene & Hall, 2010). We will posit the need for greater use of mixed methods research in the health sciences and will examine a research exemplar that has utilized a "concurrent triangulation mixed methods design" to evaluate the extent to which cognitive function and knowledge affect self-care among heart failure patients (Dickson, Lee & Riegel, 2011).

2. The continuing conundrums

It is not our intent to present an extensive background history into either the qualitative/quantitative debate or the origins of mixed methods research. The interested reader is referred to several excellent discussions on these topics (e.g., Johnson, Onwueghuzie & Turner, 2007; Tashakkori & Teddlie, 2003; Tashakkori & Teddlie, 2010). Some writers might even argue that we have moved beyond the qualitative vs. quantitative debate, and can now freely use mixed-methods designs to carry out relevant and valuable research (Teddlie & Tashakkori, 2012). If so, why aren't we using mixed-methods designs more often? While there has been a dramatic increase in recent years in the use of mixed methods research in the health sciences (Ivankova & Kawamura, 2010), there still remains, in our opinion, a residue of spoken and unspoken prejudices from the quantitative-qualitative debates that took place during

the 1970s and 1980s. Moreover, it could very well be that the philosophical stances of the two paradigms are too divergent to be successfully integrated on specific research topics (Wiggins, 2011).

3. What the nay-Sayers share in common

Some researchers would argue that the two philosophical foundations, their assumptions and methodological approaches are incompatible, that they do not study the same phenomenon. Therefore, it would be inappropriate to mix quantitative and qualitative methods. Further, these nay-Sayers would argue that researchers who attempt to combine the two divergent methods are flirting with inevitable failure due to the fundamental philosophical differences in the underlying systems (Howe, 1988; Tashakkori & Teddlie, 2003 and 2012). That is, *one paradigm precludes the other* "just as surely as the belief in a round world precludes belief in a flat one" (Guba, 1987).

Those who support the incompatibility argument would also point to the disparity in philosophical approaches to data collection that exist between the two paradigms. That is, qualitative researchers use ethnographic prose, historical narratives, first-person accounts, photographs, life histories, and biographical and autobiographical materials, among others while quantitative researchers rely more on mathematical models, statistical tables, and graphs (Denzin & Lincoln, 1994).Given the disparities between the two methodological camps, we are left with the stalemate presented in Figure 1 and wonder whether a successful marriage can indeed be formed from such divergent paradigms.

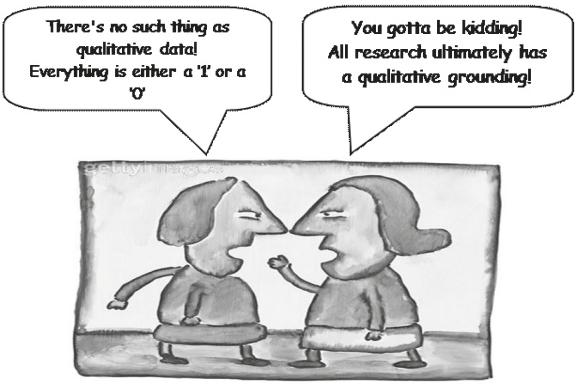

Figure 1. Alas, those continuing conundrums …

4. Do we speak the same language?

The communication challenges that exist between the "quals" and the "quans" may be the result of a lack of understanding about each other's philosophical base. It also could be inherent in the contrasting language spoken by both camps.

In their discussion of major issues and controversies involved in the use of mixed methods in the social and behavioral sciences, Teddlie and Tashakkori (2003) point out the language barriers that exist between the two paradigms. As an example, the authors outlined the types of validity that could be potentially discussed in both qualitative and quantitative research. Table 1 lists a few of these types of validity that the authors identified.

The authors point out the difficulty of forming a lasting "marriage" between the two paradigms when the language barrier is so strong. With the increased interest in mixed methods research, Tashakkori and Teddlie (2012) suggest that not only is "bilingualism" a critical attribute if the two paradigms are to be successfully integrated; "trilingualism" that includes the language of mixed methods research is a more valued skill.

Table 1. Examples of types of validity reported in qualitative and quantitative research (Teddlie & Taskakkori, 2003)

Examples of validity by type of paradigm	
Quantitative	Qualitative
Internal	Catalytic
Statistical conclusion	Crystalline
External validity	Descriptive
Construct validity • Convergent • Discriminant • Factorial	Evaluative Generalizability Interpretive Ironic
Measurement • face • content • criterion-related • predictive • concurrent • jury • systemic	Neopragmatic Rhizomic Simultaneous Situated Theoretical Voluptuous
… Plus a number of others	… Plus a number of others

5. How does the academic environment contribute to this rocky "marriage"?

The academic environment may contribute to the rocky "marriage" between qualitative and quantitative methodologies. Faculty members are often recognized for their paradigm preferences with some espousing the attributes of qualitative inquiry while others eschew the merits of quantitative methodologies. Within graduate programs especially, it is common to observe faculty members heatedly discussing which paradigm should come first in the curriculum and which should be given priority. Typically the side that is taken in these "discussions" is based more on paradigm preference (and prior education) than on curriculum logic. As a result, quantitative inquiry traditionally dominates the educational hierarchy with mixed methods approaches relegated to the periphery.

Graduate students seek out faculty and traditions with which they feel most comfortable. Munhall (2007) has observed that some students are naturally qualitative researchers while others are naturally drawn to quantitative research. Their talents, capabilities and interests position them to excel in one kind of thinking. Whether by nature or nurture, students who align with a particular research tradition are encouraged to take only those courses that fit their designated research tradition (e.g., advanced statistics instead of discourse analysis or vice versa). Without the introduction of mixed methods approaches, students' research careers remain "monolingual" rather than "multilingual". Cultivating a second or third epistemological "language" requires a concerted effort by students and faculty.

The question for faculty members, then, is how do we reframe our conversations from continuing conundrums to a civil cohabitation as we teach graduate students about the merits of both qualitative and quantitative methodologies? Better still, how do we generate enthusiasm about the thrills made possible through mixed-methods research? Faculty members need to attend to our divergent languages, increase dialogue, and look more to combining rather than getting a toe-hold up in comparison to "the other". Rather than guard our own terrain and emphasize distinctions, a more productive path may be in acknowledging those differences and, in particular, welcoming mixed methods research in our own research areas and graduate curricula.

6. Why not mixed methods research in the health sciences?

Without a doubt there are different philosophical and methodological assumptions that serve as the foundation for quantitative and qualitative research. Yet, just because the two philosophical foundations are different does not mean that they are necessarily incompatible or mutually exclusive. We suggest that we move closer to using a model of mixed methods research as a logical alternative to our "either" … "or" qualitative vs. quantitative paradigms. While this approach may be wrought with challenges, we believe that a mixed methods approach in the health sciences offers the opportunity to meld the advantages of both paradigms.

Many varying definitions of mixed methods are available in the literature not all of which are in agreement (e.g., Johnson, Onwuegbuzie & Turner, 2007; Leech, 2010; Morse, 2010; Morse & Niehus, 2009). Johnson et al. (2007) offer a composite definition of mixed methods: mixed methods research is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoint, data collection, analysis, inference techniques) for the purposes of breadth and depth of understanding and corroboration.

Morse and Niehus (2009) have further defined mixed methods designs as "A scientifically rigorous *research project*, driven by inductive or deductive *theoretical drive*, and comprised of a qualitative or quantitative *core component* with qualitative or quantitative *supplementary component(s)*". Neither the qualitative nor the quantitative are "privileged" with one method consistently dominant over the other. Which method is dominant depends on the question and the theoretical drive of the study …

The Morse and Niehaus definition suggests that one paradigm is *supplementary* to the other and that the core component could differ depending on the study's specific research aims. Other writers (e.g., Teddlie & Tashakkori, 2009) indicate that the two paradigms could also be complementary and conducted with neither component subservient to the other. Again, the direction that the process takes very much depends on the study aims.

7. When should mixed methods be used?

Advocates of mixed methods designs agree that researchers need to be cautious about when to use the approach (Leech, 2010). Typically mixed methods are used when the quantitative or qualitative approaches, by them-

selves, are inadequate to gain a complete understanding about a research problem or question. For example, a researcher may want to examine an issue from multiple perspectives, e.g., obtain a macro picture of a health care system while seeking micro information from those who utilize that system in order to develop a more complete understanding a given issue. A researcher may also seek to compare, validate, or triangulate results, and to examine processes/experiences along with outcomes (Plano Clark, 2010). The researcher's goal may be to develop a survey instrument, an intervention, or a program informed by qualitative findings (Plano Clark, 2010). A quantitative phase could also be followed by a qualitative phase, the intent of which may be to help determine the best participants with which to follow up or to explain the mechanism behind the quantitative results (Plano Clark, 2010).

8. How should a mixed method approach be designed?

There are a number of excellent resources available to assist the investigator in designing and conducting mixed methods research (e.g., Creswell & Plano Clark, 2011; Creswell et al., 2011; Morse & Niehus, 2009); to outline the steps to designing such a study would be inadequate given the limited space of this article. Rather we would like to examine one exemplar that has been reported in the health sciences literature (Dickson, Lee & Riegel, 2011) in which the investigators examined how cognitive function and knowledge affected heart failure self-care. This exemplar was chosen, not because of its topic but because of the authors' thoughtful use of quantitative and qualitative paradigms in combination to best answer their research questions.

In their introduction, the authors indicate that despite extensive patient education, few heart failure patients master self-care. They further suggest that impaired cognitive function may help to explain why patient education is ineffective. The investigators used a concurrent triangulation mixed methods design to explore how knowledge and cognitive function influence heart failure self-care. To justify their choice of mixed methods research, Dickson et al. (2011) argued that understanding heart failure self-care requires the integration and in-depth exploration of multiple variables known to influence self-care. For that reason, they used quantitative and qualitative data in combination to determine overlapping or different faces of this complex relationship in order to achieve a more in-depth understanding of the self-care construct.

Forty-one adults with heart failure participated in interviews about self-care and completed standardized instruments measuring knowledge, cognitive function and self-care. Quantitative measures of self-care, knowledge and cognitive function as well as qualitative data about HF self-care practices obtained though semi structured interviews were collected at the same time. Figure 2 outlines their mixed methods approach to combining both the quantitative and qualitative paradigms.

The authors explained that the quantitative and qualitative data were collected in the same data collection session (thus the description, "concurrent"). Consistent with their study aims the authors determined that each paradigm would be given equal focus. Triangulation was used to strengthen the validity of their findings. The authors explained that the essence of triangulation is that methods consist of independent assessments of the same phenomenon. Investigators conducted qualitative and quantitative data analysis separately, blinded to the corresponding data for each patient from the alternate method. The analyzed data were integrated during the interpretation phase using triangulation methods to assess concordance between the qualitative and quantitative results. Both qualitative and quantitative evidence related to self-care and knowledge were compared using an interactive approach rather than maintaining independence.

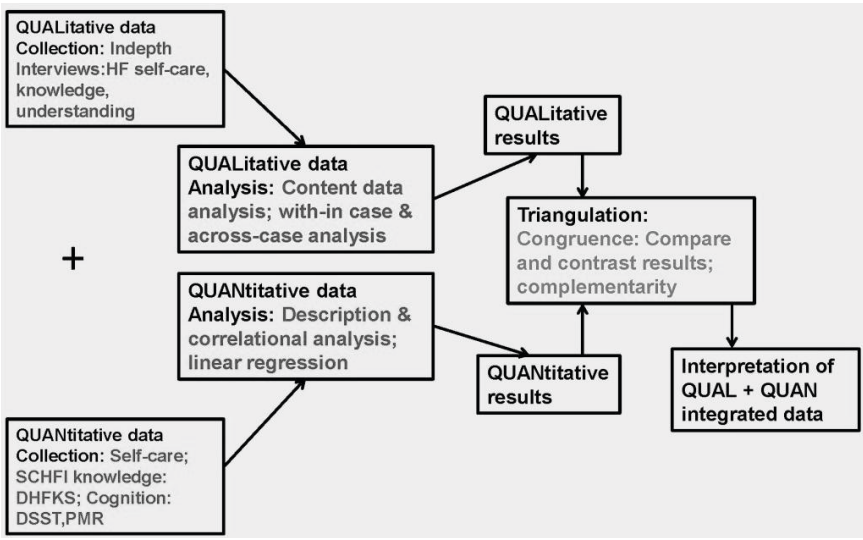

Figure 2. Dickson et al's (2011) approach to their mixed methods deign

The authors argued that they were able to validate evidence of self-care and knowledge and could identify cases where there was inconsistency. Themes that had emerged from the qualitative analysis (e.g., accounts of decreased cognitive function, knowledge deficits and lack of understanding) were re-examined across cases to understand the results of their quantitative findings. The mixed methods approach provided insight into the reasons why self-care was poor among many persons with HF despite evidence that the patients had knowledge about routine maintenance and management practices. The qualitative data revealed that lack of understanding, not lack of knowledge, was a key driver in self-care. Some who were inconsistent in self-care also had evidence of mild cognitive impairment. The advantages of mixed methods as a research technique to study clinical phenomenon were clearly evident in this study. Quantitative methods did not explain the gap between knowledge and self-care practices. By integrating the qualitative results with the quantitative findings, a more complete and nuanced description of the relationships emerged.

9. Methodological challenges in conducting mixed methods investigations

It is not always appropriate to combine qualitative and quantitative methods to access phenomena that health researchers are interested in (e.g., lived experiences as a patient or patients' perspectives of doctor-patient relationships) (Sale & Lohfeld, 2002). The phenomenon under study may not be the same across methods. Sale and Lohfeld (2002) also argue that loss of information can occur when attempts are made to unite results from the two paradigms because the tendency can be to selectively search for similarities rather than dissimilarities in data. Researchers who hold different philosophical positions may find mixed methods research to be challenging because of the tensions created by their different beliefs (Greene, 2007). However, mixed methods research also represents an opportunity to transform these tensions into new knowledge through a dialectical discovery. Divergent findings, while potentially unsettling are valuable. They can lead to a reexamination of the conceptual framework underlying the research.

9.1. Time, teamwork, and resources

Because multiple forms of data are being collected and analyzed, mixed methods research requires extensive time, teamwork, and resources to carry

out the multiple steps involved in mixed methods research, including the time required for data collection and analysis.

Given that research team members come from many different backgrounds, one can anticipate that these different perspectives will contribute to both the challenges and benefits of a team approach to mixed methods research. While it is not necessary or possible for everyone to hold expertise in all methods employed in any research project, all of the team members need to be open to a mixed methods perspective,

9.2. Sampling issues

When undertaking a mixed methods study, it is important to estimate reasonable sample sizes for both the quantitative and qualitative phases of data collection and analyses. For example, in the Dickson et al. (2011) study 41 participants were more than adequate for their qualitative analyses but insufficient for their regression analyses.

10. Summary

The ultimate goal of any research is to answer the questions that were laid out at the beginning of the project. Mixed methods are useful if they provide us with stronger possibilities to answer our research questions. They also help researchers to evaluate the "goodness" of their answers and provide the opportunity for presenting a greater diversity of differing views (Teddlie & Tashakkori, 2003). The importance of complementarity in blending the best from qualitative and quantitative paradigms cannot be underestimated. It is our opinion that we, as research investigators, faculty members, and keepers of the keys for future generations need to reframe our conversation from continuing conundrums to a civil cohabitation as we explore with graduate students the valued potential of both qualitative and quantitative methodologies both by themselves and in combination. As Creswell (Creswell, cited by Leech, 2010) indicated, graduate students are "the prime movers in the field of mixed methods research as they are the majority of the people who are attending mixed methods research workshops and are 'looking for new ways of doing research and are not afraid of trying out new methodology'". By increasing faculty dialogue with students and with each other, we can build departments and programs with mixed-methods strengths and overcome a problem-focused view of methodological conundrums.

References

Bryman, A. (1984). The debate about quantitative and qualitative research: a question of method or epistemology? *The British Journal of Sociology*, 35 (1), 75-92.

Creswell, J.W. (2010). Mapping the developing landscape of mixed mehods research. In: Tashakkori, A., & Teddlie, C. (eds.), *Handbook of mixed methods in social and behavioral research*, 2nd ed. Thousand Oaks, CA: Sage, pp. 45-68.

Creswell, J.W., Klassen, A.C., Plano Clark, V.L., & Smith, K.C. (2011). *Best practices for mixed methods research in the health sciences*. Commissioned by the Office of Behavioral and Social Sciences Research.

Creswell, J.W., & Plano Clark, V.L. (2011). *Designing and conducting mixed methods research*, 2nd ed. Thousand Oaks, CA: Sage.

Cwikel, J.G. (2006). *Social epidemiology: strategies for public health activism*. New York: Columbia University Press.

Denzin, N.K., & Lincoln, Y.S. (1994). *Handbook of qualitative research*. Thousand Oaks, CA: Sage.

Dickson,V.V., Lee, C.S., & Riegel, B. (2011). How do cognitive function and knowledge affect heart failure self care? *Journal of mixed methods research*, 5 (2), 167-189.

Greene, J.C., & Hall, J.N. (2010). Dialectices and pragmatism: being of consequence. In: Tashakkori, A., & Teddlie, C. (eds.), *Sage handbook of mixed methods in social and behavioral research*, 2nd ed. Thousand Oaks, CA: Sage, pp. 119-143.

Greene, J.C. (2007). *Mixed methods in social inquiry*. San Francisco: Jossey-Bass.

Guba, E.G. (1987). What have we learned about naturalistic evaluation? *Evaluation Practice*, 8, 23-43.

Howe, K.R. (1988). Against the quantitative-qualitative incompatibility thesis (or dogmas die hard). *Educational Researcher*, 17 (8), 10-16.

Ivankova, N.V., & Kawamura, Y. (2010). Emerging trends in the utilization of integrated designs in the social, behavioral, and health sciences. In: Tashakkori, A., &. Teddlie, A. (eds.), *Sage handbook of mixed methods in social and behavioral research*, 2nd ed. Thousand Oaks, CA: Sage, pp. 581-611.

Johnson, B., & Gray, R. (2010). A history of philosophical and theoretical issues for mixed methods research. In: Tashakkori, A., &. Teddlie, A. (eds.), *Sage handbook of mixed methods in social and behavioral research*, 2nd ed. Thousand Oaks, CA: Sage, pp. 69-94.

Johnson, R.B., Onwuegbuzie, A.J., & Turner, L.A. (2007). Toward a definition of mixed methods research. *Journal of Mixed Methods Research*, 1 (2), 112-133.

Leech, N. (2010). Interviews with the early developers of mixed methods research. In: Tashakkori, A., &. Teddlie, A. (eds.), *Sage handbook of mixed methods in*

social and behavioral research, 2nd ed. Thousand Oaks, CA: Sage, pp. 253-272.

Mendlinger, S., & Cwikel, J. (2008). Spiraling between qualitative and quantitative data on women's health behaviors: a double helix model for mixed methods. *Qualitative Health Research*, 18 (2), 280-293.

Morse, J. (2010). Procedures and practice of mixed method design: maintaining control, rigor, and complexity. In: Tashakkori, A., &. Teddlie, A. (eds.), *Sage handbook of mixed methods in social and behavioral research*, 2nd ed. Thousand Oaks, CA: Sage, pp. 339-352.

Morse, J., & Niehus, L. (2009). *Mixed method design: principles and procedures*. Walnut Creek, CA: Left Coast Press.

Munhall, P.L. (2007). *Nursing research: a qualitative perspective*. Sudbury, MA: Jones & Bartlett.

Plano Clark, V.L. (2010). The adoption and practice of mixed methods: U.S. trends in federally funded health-related research. *Qualitative Inquiry*, 6 (6), 428-440.

Sale, J.E.M., Lohfeld, L.H., & Brazil, K. (2002). Revisiting the quantitative-qualitative debate: implications for mixed-methods research. *Quality and Quantity*, 36, 43-53.

Tashakkori, A., & Teddlie, C. (2003). *Handbook of mixed methods in social and behavioral research*. Thousand Oaks, CA: Sage.

Tashakkori, A., & Teddlie, C. (2010). *Handbook of mixed methods in social and behavioral research*, 2nd ed. Thousand Oaks, CA: Sage.

Teddlie, C., & Tashakkori, A. (2003). Major issues and controversies in the use of mixed methods in the social and behavioral sciences. In: Tashakkori, A., & Teddlie, C. (eds.), *Handbook of mixed methods in social and behavioral research*. Thousand Oaks, CA: Sage.

Teddlie, C., & Tashakkori, A. (2009). *The foundations of mixed methods research: integrating quantitative and qualitative techniques in the social and behavioral sciences*. Thousand Oaks, CA: Sage.

Teddlie, C., & Tashakkori, A. (2010). Overview of contemporary issues in mixed methods research. In: Tashakkori, A., & Teddlie, C. (eds.), *Handbook of mixed methods in social and behavioral research*, 2nd ed. Thousand Oaks, CA: Sage.

Teddlie, C., & Tashakkori, A. (2012). Common "Core" characteristics of mixed methods research: a review of critical issues and call for greater convergence. *American Behavioral Scientist*, 56 (6), 774-788.

Wiggins, B.J. (2011). Confronting the dilemma of mixed methods. *Journal of Theoretical and Philosophical Psychology*, 11 (31), 44-60.

Meeting a cancer patient in pain: stories of difficulties

Daniela Leone [1, 2] **- Stefania Anania** [1] **- Ivan Fossati** [3]
Claudio Cassardo [3] **- Vittorina Zagonel** [1] **- Elena Vegni** [1, 3]

[1] *CURA Centre, University of Milan, Italy*

[2] *San Paolo University Hospital, Milan, Italy*

[3] *Istituto Oncologico Veneto, Italy*

daniela.leone@unimi.it

Abstract

Current literature only partially explored the physician's experience of being with a cancer patient in pain. The aim of the study was to explore the internal representation of physicians specialized in oncology and pain medicine of a challenging meeting with a cancer patient in pain. Using a written open narrative format, 46 physicians specialized in oncology and pain medicine were asked to tell "the story of a challenging meeting with a patient who was in pain". The narrations were analysed in accordance to Interpretative Phenomenological Analysis. Three main categories were identified each with sub-themes: (1) "Non-written stories"; (2) "Written stories"; (3) "Family members". The study showed the difficulty to be patient centered, in a context in which the pain is central, forbidding a relation between human beings. The family members, a third party, could be an interesting medium to consent a possible, and difficult, human relation.

Keywords: Interpretative phenomenological analysis; Oncologists and pain medicine specialists' representation; Pain; Qualitative research

1. Introduction

Pain represents a challenge in the oncologic and palliative care context due not only to its clinic complexity but also to the emotional and motivational concomitants of persisting pain symptoms (Perl, 2007). Specialists

in pain medicine commonly experience psychological assaults to their self-esteem and their self-protective and defensive coping mechanisms when being with patients in pain who seem unreasonably demanding (Banja, 2008; Twycross, 2002). Those theoretical understanding of the experience of being with a patient in pain are supported by very few evidence. In a previous contribution we studied the views of physicians managing patients experiencing pain in an experiential perspective (Vegni et al., 2005). The study proposed a very general view around the concept of being in relation with a patient in pain and only 25 subjects out of 151 participants were oncologists.

Because of the peculiar significance of pain in cancer and palliative cancer care, the aim of the present study was to explore the internal representation of physicians specialized in oncology and pain medicine of a difficult encounter with a patient in pain. In particular, the study aimed to answer to the following research questions: which is the internal representation of physicians who meet oncological patients in pain? Which is the origin of their difficulty? Which kind of resources are implicitly described by these physicians?

2. Methods

2.1. Sample and data collection

At the beginning of a training program on pain management, physicians specialized in oncology and pain medicine were asked to write: "[…] the story of a challenging meeting with a patient who was in pain". The use of written material constitutes a particular tool in qualitative research. Writing a story entails unique aspects for an in-depth understanding of a given experience: the choice of what to tell and what to omit is entirely up to the narrator, as the language chosen (Graffigna et al., 2011); moreover, the narrative engages the reader and invites interpretation, offering the experience of "living through", and not simply "knowledge about" (Greenhalgh & Hurwitz, 1999).

Narrations were anonymous; socio-demographic data were collected. Results of a preliminary analysis were discussed as a part of the training program. Physicians signed an informed consent to use their narratives in the present study. The study was approved by the Ethical Committee of the San Paolo Hospital, Milan, Italy.

2.2. Data analysis

The narratives were analyzed in accordance to Interpretative Phenomenological Analysis (IPA) (Conroy, 2003; Richards & Morse, 2007). IPA allows the analysis of the individual's lived experiences and of the way in which sense is attributed to the experiences. While Grounded theory (Pope et al., 2000) aims at explaining a psychosocial phenomenon during time until the construction of a theory, IPA deals with psycho-emotional phenomena aiming at a deep comprehension of the possible subjective and even unconscious meaning of being in a peculiar lived experience (Smith et al., 1999). Interpretation is critical to this process of understanding: the challenge is not to bracket our interpretations of a text but rather to work with them in the quest towards understanding (Smythe et al., 2008). The analysis of texts is an iterative, inductive process that starts from a detailed reading of the texts. At the beginning a limited number of narratives are analyzed in order to provide researchers with a deeper understanding of the same (Smith et al., 2009). At this stage, the researchers took notes about the meanings that participants attributed to their experience (Smith et al., 2009). The analysis proceeds with several re-readings, and with sharing interpretations to detect and describe the themes present and the interconnections between them. The end of this process occurs when a place of sensible meaning is reached, free of inner contradictions (Smith et al., 2009). In our research, IPA was performed by two researchers (C.C., D.L.) who independently read and coded 25 narratives, randomly chosen, identifying an extensive list of the issues that were explicitly or implicitly described in the stories. In a joint meeting the issues were discussed and grouped in categories. An independent researcher (E.V.), read the narratives and provided feedback on the veracity of the categories (Morse et al., 2002). The 21 additional narratives were read in order to ensure the completeness of the categories identified. Excerpts were chosen from all the narratives to explain the categories. The final results were extensively discussed with a palliative care physician (V.Z.), to gain a clinical perspective.

3. Results

46 narratives were collected. See Table 1 for socio-demographic data are presented in three categories were identified to describe the physicians' experiences: (1) "Non-written stories"; (2) "Written stories"; (3) "Family members". Description of results is followed by excerpts (in round brackets the narrative's code from which the excerpt is taken).

Table 1. Social and demographic characteristics of the sample (n = 46)

	Mean age (range)	Mean profess age (range)	Professional position		
			Chief	Assistant	Resident
Tot (46) *	53.4 (31-66)	26 (2-40)	23 (52.3%)	21 (47.7%)	0
M (38) 84.4%	54.2 (42-66)	26.8 (10-40)	20 (45.5%)	17 (38.6)	0
F (7) 15.6%	49.3 (31-59)	21.7 (2-32)	3 (6.8%)	4 (9.15)	0

* The gender % is calculated on a total of 45 subjects (1 is unknown); for all other values (age, professional age, and position) averages and % are calculated on a total of 44 subjects (2 are unknown).

(1) *Non-written stories.* The "non-written stories" describe the disease as if they were clinical charts. The "human" element is removed, the stories are free of interpretation or involvement, are not commented, nor narrated.

"40 year old patient with pulmonary K, bone metastasis, opioid resistant pain. Appearance of painful brain metastasis → opioid medication → radiation therapy vomiting caused by opioid medication → hallucinatory syndromes. Limit situation: alteration of pain threshold, tolerance to painkillers, hypersensitivity" (27).

Sometimes suspension dots, question marks and non-technical words are used, thus suggesting the willingness of telling without saying and leaving the reader the difficult task to understand the meaning and uncover the unsaid: "22 year old female, affected by osteosarcoma of the left humerus with lung metastasis, mother of 2 children, five months pregnant, for this latter reason, adequate pain therapy is denied. VAS pain: 9 (untreated pain with memory +++). What to do? Radicular block" (26).

(2) *Written stories.* The "written stories" help the reader to understand why some stories were not written. The types of difficulties that emerge are related to: the physician, the pain and the relationship.

Stories of physicians. The main character is the physician in the role of "Hero-Divinity" who can save life (from death) or even save death (from pain).

"The husband asked me to visit the wife at home […] for days she had been suffering uncontrollable pain […]. I was suddenly face to face with a pale-eyed woman of faded beauty […]. I told her I would take care of her and her pain, if only she would trust in me. I caressed her face and promised I would visit her again soon. The day after, the husband told me the wife had rested well all through the night. It had not happened for months" (13).

"At the end pain has been broken through […] sedation (at least he died in peace!)" (16).

Stories of pain. Pain is the protagonist while the patient is the great absentee.

"As if in slow motion and with eyes like a wounded animal, I was suddenly face to face with a pale-eyed woman of faded beauty […]" (13).

Besides de-humanizing the patient, the pain seems to consume the doctor's omnipotence, exposing to the limits of his/her own or of medicine.

"The patient does not complain, does not protest, does not threaten to sue or anything […] the patient does not even 'glare' at you. The patient just bears with the pain […]. This kind of patient is disarming, the kind of patient that forces you to face your personal limits […]" (22).

"I had to care for my hospital's chaplain, affected by an inoperable tumor of the pancreas […] he began presenting acute pain symptoms that did not respond to medication: 'Doctor, why do you suffer for my pain? I do not like to see you so sad just because you cannot alleviate my suffering. I have He who gives me the strength to endure' […]" (37).

Stories of difficult or impossible relationships. In those stories where an omnipotent Hero and a de-humanizing Pain are described, the relation is sometimes very difficult or impossible to build: it seems there is no way to have a relationship based on a mutual understanding.

"[…] the patient senses that the doctor possesses the technical skills to remove her pain […] but: 'Doctor, I don't want you to get rid of all my pain, but only a part of it, to be able to live better'. […] I would have needed the capacity to understand the meaning of that pain" (32).

"A 50 year old male, father of 2 children […]. Increasingly I realized that the patient's pain goes beyond the merely biological aspect. It is an existential pain that decidedly requires a human, and most of all, spiritual approach which, perhaps, we had been lacking" (85).

(3) *Family members.* Even if not mentioned in all the stories, the issue of Family members constitutes the third knot of meaning in the narratives. The family member may have two roles: he/she is a sort of amplifier of the patients; or he/she is the "other", a third party in the relation, and a witness.

Family members as amplifier of the patient. Family members are often identified with the patient and must be cared for and protected due to the anticipatory grief for the loss of the loved one: in the doctor's view, a personal loss and a defeat.

"Yesterday I was at the death-bed of a 23 year-old patient affected by terminal cancer […]. Suddenly, with her mother present, the patient asked me: 'Doctor, how much longer will I have to suffer?'. […] the relative broke down

into tear uncontrollably and at the time, I too was deeply moved. I drew a long sigh, moved closer and took her hands in mine and despite my efforts one single, but interminable tear rolled down my face. I was not able to leave her before ONE HOUR, ONE hour of interminable silence had passed» (35).

Family members as witnesses. Family members act as the spokesperson for the relationship, thereby preserving it. They are a third party who may consent the physician to experience pain in a safe manner: not the devastating and totalizing pain of the patient, but a more human and thinkable pain.

"I thought about her pain, a mother's pain, and the psychological and physical pain of her child […]. I remember that I prescribed oral morphine. Few days later I received a telephone call from a family member informing me of the child's death […]. They thanked me because I had helped, with my simple prescription, to give the child one last, innocent smile" (14).

4. Discussion

Relating to seriously ill exposes physicians to complex feelings (Meier et al., 2001). The physician's clinical work with patients in pain is especially distressing both because it is often not possible to fully alleviate the pain and because the relationship is very complex (Vegni et al., 2005). No studies have been conducted to understand how physicians experience the relationship with a cancer patient in pain. Our results seem to add some new understanding of this experience.

"Non-written stories" seem to confirm the difficulty to experience a feeling of empathy with cancer patients in pain. While the need of considering the patient's subjective experience and patient-centered cancer care have become a priority, especially in the field of oncology (Pelzang, 2010; Haidet et al., 2009), studies described the pattern of communication with cancer patients in pain as typically disease and physician-oriented (Berry et al., 2003). Non-written stories help us to understand the physician's subjective experience of being disease-centered (i.e., avoid emotional involvement), while the "Written stories" suggest a possible reason for the prevalence of a physician-centered approach: the pain is a wall that moves away the patient, becoming a non-human subject to care or even to cure. A process of clinician's detachment who tend to "avoid otherness" (Favre et al., 2007) may result as a functional mode of coping within a relation with a not human subject such as pain.

Also the semantic knot of "Family members" appears very interesting. The presence of the family member reinforces the theme of a subject-patient

annulled or at very least diminished by pain: where the other is cancelled by suffering and the family member is no more than the amplification of this pain, a paternalistic (Emanuel & Emanuel, 1992) approach seems almost necessary. On the other hand, physicians also point to another role for the family as a third party who permits the physician to "remain different" that is to avoid dissolving into identification with the patient. To talk with the family shouldn't be seen as a way to avoid talking with the patient: a clinician who speaks, confronts and shares with family members is perhaps capable of losing the role of the Hero and acknowledging his/her limits, accepting the relationship with the family member as the only possible.

The study has a series of limits, in addition to those that are naturally inherent to the qualitative methodology. The experiences refer to a complex semantic field where being with cancer patients in pain is twisted to being with dying patients. One previous study (Aase et al., 2008) conducted on physicians who had to cope with the issue of death sheds light on the key concept of vulnerability as an essential element of the medical profession: further studies may analyze the importance of the variable "patient who dies" in the case of "cancer patient with pain".

Acknowledgments

We are grateful to all the doctors who participated in the study. We thank Grünenthal, the sponsor who provided the financial support for the training program on pain management in which data had been collected.

References

Aase, M., Nordrehaug, J.E., & Malterud, K. (2008). "If you cannot tolerate that risk, you should never become a physician": a qualitative study about existential experiences among physicians. *Journal of Medical Ethics*, 34, 767-777.

Banja, J.D. (2008). Toward a more empathic relationship in pain medicine. *Pain Medicine*, 9, 1125-1129.

Berry, D.L., Wilkie, D.J., Thomas, C.R. Jr., & Fortner, P. (2003). Clinicians communicating with patients experiencing cancer pain. *Cancer invest*, 21, 374-381.

Conroy, S.A. (2003). A pathway for interpretive phenomenology. *Inernational Journal of Qualitative Methods*, 2, 36-62.

Emanuel, E.J., & Emanuel, L.L. (1992). Four models of the physician-patient relationship. *The Journal of the American Medical Association*, 267, 2221-2226.

Favre, N., Despland, J.N., de Roten, Y., Drapeau, M., Bernard, M., & Stiefel, F. (2007). Psychodynamic aspects of communication skills training: a pilot study. *Support Care Cancer*, 15, 333-337.

Graffigna, G., Vegni, E., Barello, S., Olson, K., & Bosio, A.C. (2011). Studying the social construction of cancer-related fatigue experience: the heuristic value of Ethnoscience. *Patients Education and Counselling*, 82, 402-409.

Greenhalgh, T., & Hurwitz, B. (1999). Why study narrative? *BMJ*, 318, 48-50.

Haidet, P., Fecile, M.L., West, H.F., & Teal, C.R. (2009). Reconsidering the team concept: educational implications for patient-centered cancer care. *Patientient Education and Counseling*, 77, 450-455.

Meier, D.E., Back, A.L., & Sean Morrison, R. (2001). The inner life of physicians and care of the seriously ill. *Journal of the American Medical Association*, 286, 3007-3014.

Morse, J.M., Barrett, M., Mayan, M., Olson, K., & Spiers, J. (2002). Verification strategies for establishing reliability and validity in qualitative research. *International Journal of Qualitative Methods*, 1 (2). Retrieved DATE from http://www.ualberta.ca/~ijqm.

Pelzang, R. (2010). Time to learn: understanding patient-centered care. *British Journal of Nursing*, 19, 912-917.

Perl, E.R. (2007). Ideas about pain. A historical view. *Nature Review*, 8, 71-80.

Pope, C., Ziebland, S., & Mays, N. (2000). Analysing qualitative data. *BMJ*, 320, 114-116.

Richards, L., & Morse, M.J. (2007). *Readme first. For a user guide to qualitative methods*, 2nd ed. Thousand Oaks, CA: Sage.

Smith, J., Jarman, M., & Osborne, M. (1999). Doing interpretative phenomenological analysis. In: Murray, M., & Chamberlain, K. (eds.), *Qualitative health psychology*. London: Sage.

Smith, J.A., Flowers, P., & Larkin, M. (2009). *Interpretative phenomenological analysis: theory method and research*. London: Sage.

Smythe, E.A., Ironside, P.M., Sims, S.L., Swenson, M.M., & Spence, D.G. (2008). Doing Heideggerian hermeneutic research: a discussion paper. *International Journal of Nursing Studies*, 45, 1389-1397.

Twycross, R.G. (2002). The challenge of palliative care. *International Journal of Clinical Oncology*, 7, 271-278.

Vegni, E., Mauri, E., & Moja, E.A. (2005). Stories from doctors of patients with pain. A qualitative research on the physicians' perspective. *Support Care Cancer*, 13, 18-25.

Patient's choice of observational strategy for early-stage prostate cancer

Lara Bellardita [1, 2] - **Guendalina Graffigna** [1]
Simona Donegani [1] - **Daniela Villani** [3] - **Silvia Villa** [1]
Veronica Tresoldi [1] - **Cristina Marenghi** [1]
Tiziana Magnani [1] - **Riccardo Valdagni** [1]

[1] *Prostate Cancer Program, IRCCS Istituto Nazionale dei Tumori, Milano, Italy*

[2] *Department of Psychology, Catholic University, Milano, Italy*

[3] *Radiation Oncology 1, Fondazione IRCCS Istituto Nazionale dei Tumori, Milano, Italy*

lara.bellardita@istitutotumori.mi.it

Abstract

Active Surveillance (AS) may represent for selected patients with low risk, potentially indolent prostate cancer (PCa) a viable alternative to radical therapies, thus reducing the risk of over-treatment. Researchers and clinicians emphasized that the choice of AS may be a controversial one as patients have the chance to avoid the side effects of radical therapies but also the burden of living with an untreated PCa. The aim of our study is to focus on the decision-making process leading patients to elect AS amongst different therapeutic options. An observational, qualitative study was conducted. Between 2007 and 2009, 46 patients (mean age 67 years) were administered a semi-structured interview at enrolment in the Prostate Cancer Research International: Active Surveillance protocol. The focus of the interview was on the first question, i.e. "Why did you choose AS?". Interviews were audio-recorded and verbatim transcriptions were made. Content analyses were performed by using a text-driven, automatic software (T-lab). Four clusters of themes emerged. In cluster 1, the most meaningful theme was the ambivalence in front of different therapeutic options. In cluster 2, the focus was on patients' assessment of the aggressiveness of their PCa. In cluster 3, the topic was the collection of information from specialists. In cluster 4, the main theme was the collection of data through informal sources. Patients are motivated to opt for AS based on the subjective evaluation of medical information as well as characteristics of their psycho-social context. Understanding motivation for AS will help clinicians support patients in making the best choice for them.

Keywords: Choice; Prostate cancer; Active surveillance; Patient's engagement

1. Introduction

Prostate cancer (PCa) is the most common solid cancer in males and the second most common cause of cancer-related death among men in the Western World. Estimated incidence for 2008 was 186.000 in the United States (Jemal et al., 2008) and 382.000 in Europe (Ferlay, Parkin & Steliarova-Foucher, 2010). The incidence of PCa has been increasingly rising mainly due to aging population and widespread use of opportunistic screening of Prostate-Specific Antigen (PSA), together with increased clinicians', as well as patients', awareness of the disease (Associazione Italiana dei Registri Tumori & Associazione Italiana di Oncologia Medica, 2011).

Early diagnosed PCa can be radically treated with equally effective therapies, i.e., prostatectomy, external beam radiation therapy and brachytherapy (Heidenreich et al., 2011). Recent studies showed that early-diagnosed PCa, classified as low-risk and potentially indolent are likely to be often overtreated with no advantage in reducing mortality (Cooperberg, Carroll & Klotz, 2011; Klotz, 2012). Those patients could be offered an observational option, defined as Active Surveillance (AS), which implies a strict monitoring through repletion of PSA test, clinical examinations and repeated biopsies. Strict monitoring of potential cancer progression allows physicians to re-direct patients to active, radical treatments without losing the so-called opportunity window: patients whose cancer is re-classified as non-indolent will have the same survival chances as if they had chosen radical therapies right after diagnosis (Klotz, 2012).

Patients who choose AS may benefit from postponing, or even avoiding, the side effects of the therapeutic options. As a matter of fact, both surgery and radiation therapies may cause detrimental consequences such as sexual, urinary and bowel dysfunctions (Hamdy, 2011).

AS is receiving more and more consensus in the field of urologic oncology due to encouraging data that have been collected throughout Europe and Northern America above all (Bul et al., 2012; van den Bergh, Vasarainen et al., 2010; van den Bergh, Steyerberg et al., 2010).

A recent review emphasized that concerns about the quality of life of patients in AS are not supported by data (van den Bergh, Korfage & Bangma, 2012) and that patients do not show psychological distress related to the idea of living with an untreated cancer (Burnet, Parker, Dearnaley, Brewin &

Watson, 2007; van den Bergh, Essink-Bot et al., 2010; Vasarainen, Lokman, Ruutu, Taari & Rannikko, 2011).

The self-reported quality of life of patients who entered an AS protocol was likely to be influenced by a number of factors, including personality characteristics and the role of the physician recommending the observational strategy (van den Bergh et al., 2009). As a matter of fact, the influence of the physicians on patients' therapeutic/observational choice was highlighted in different studies (Cohen & Britten, 2003; Coulter, 2010; Davison, So & Goldenberg, 2007). Goh et al. (2011) reported that patients who had a positive approach to PCa and who perceived that they were receiving a regular medical support were more confident in bearing the uncertainty related to possible disease progression and reported they had a higher perception of control in the decision making process (Goh et al., 2011). Pickles at al. discussed potential psycho-social barriers to the acceptance of AS and reported physicians attitudes as one of the main obstacles that needed to be overcome in order to promote the adoption of AS (Pickles et al., 2007). Other barriers were lack of appropriate information and interventions to reduce potential anxiety related to the idea that cancer could spread.

We were interested in evaluating more extensively the factors influencing the choice of AS and the decision making process that patients undergo when facing the opportunity to choose among different options including AS.

2. Methods

Our sample consisted of 46 patients (mean age 63 years, range: 43-77) with a potentially indolent PCa who were enrolled in the Prostate Cancer Research International: Active Surveillance protocol (PRIAS). PRIAS is a multi-centre disease management and research protocol for men with localized, early-stage and potentially indolent PCa, aimed at limiting the amount of over-treatment. PRIAS is a prospective, observational study promoted by Erasmus Medical Centred based in Rotterdam which started in 2006 and was joined by the Prostate Cancer Program at Istituto Nazionale dei Tumori of Milan in September 2007. Twenty-six percent of the patients had a University degree, 51.2% had attended high school, 15% had vocational education, 3% had attended junior high school and 5% primary school. Ninety-two percent of the patients reported to have a partner. Patients who accepted to participate in the study signed a Informed Consent, which was endorsed by the local Commitee of Ethics.

Patients were administrated a semi-structured qualitative interview investigating the reasons for choosing AS. The interviews – conducted by a clinical psychologist and lasting about one hour – were recorded and integrally transcribed. All interview transcripts were analysed using T-LAB (a dedicated software for qualitative text analysis; for a detailed description of the software please see: Gilardi & Lozza, 2009). In particular an Elementary Context Analyses was performed on the set of responses to the first question of the interview, i.e., "Why did you choose AS?" (Gambetti & Graffigna, 2010) in order to enucleate and systematize the most frequent themes covered by patients stories.

3. Results

The Elementary Context Analyses allowed us to obtain and explore a representation of corpus contents through few and significant thematic clusters.

This analysis identified 4 elementary thematic clusters (CE), as described in the following paragraphs.

1. The *Start* (which explained the 35.18% of the lexical variance of the textual corpus). The first CE was focused on the post-diagnosis events, on the first clinical consultation and on the patients' ambivalence in front of different therapeutic options. The most recurrent words in this cluster were "Remove" and "But". Patients highlight that prostatectomy, which in most cases is the first therapeutic option that they are recommended, seemed to be at the beginning the most suitable option: "You go for surgery, once you have everything removed, you do not have the problem anymore! But, if I understand right it's not that surgery is going to completely eliminate the problem in the long run. That's what I was told, it could come back. And radiotherapy, well, you never know how it is going to be later on". Nonetheless, patients reported that they were not completely convinced mainly because of potential side effects of prostatectomy, and radiotherapy as well: "If there were no side effects may I would have gone for surgery, you know […] you have everything removed and you do not think about it anymore. But, well, at the age of 43, remaining […] it seems that the sexual complication is the more likely and also incontinence", "Since prostatectomy it's not like having one's appendicitis removed but it has side effects" or "[…] the idea of having the prostate removed […] let's try to avoid that […] and so was it. I discarded radiotherapy […] there are side effects there as well".

2. The *Crossroad* (which explained the 12.56% of the lexical variance). This EC emphasized the assessment of the situation from the patient's. The most significant words in this cluster were "To choose" and "Aggressive". Patients showed that they tried to find a meaning to their diagnosis and felt confident that their cancer had good chances of not being aggressive: "Let's say you convinced me by saying that, based on experience of situations like mine, you can't expect to develop in such a short time a very aggressive cancer. That's why I chose it", "I chose active surveillance because from what I understood, from what I was told, it's not a severe thing. It's something that needs to be kept under control. Not aggressive, I was told". The awareness of having a form of cancer that was not life-threatening allowed them to take into consideration the observational option thus avoiding the need for surgery: "I chose it because I do not want to have surgery and after I was told there is a very low percentage of risk, well there's always a small risk but very low, I chose this thing here that is the best option for the moment", "I came here the first time and I was provided the different options and I chose active surveillance because even a good surgeon would leave me with problems affecting my quality of life […] and given that the risk in my head is minimum and that every three months I repeat the PSA".
3. The third EC, the *Map* (40.7% of the variance explained), was characterized mainly by the presence of the lexical units "To decide" and "Data". The topic of decision, which runs through the different clusters given the prompt question that was asked to the patients, was here relate to the need for collecting official, certified information, supported by different physicians and, in some cases, available literature: "At this point, one says […]. It sounds strange, I want to see things more clearly, reading, reading, reading. I look at the data of medical examination and it does not seem so relevant to me", "[The doctor said] You can do what you prefer but I can tell you that the side effects of each therapy that you will decide to undergo will make things worse compared to your actual state", "As such, if I had different parameters, they would be the first to tell We cannot propose this to you, we can propose other things. I have no reason to distrust someone presenting a situation like this one. It's obvious that I am the one choosing. It's my body that we are talking about, I am the one who decides", "And then I decided for this option! I am obviously very cautious, meaning that the examinations that they make me go through are what convince me to enter the program. The day I should see something different", "I decided because I followed this argument. If it's not an aggressive thing, an aggressive cancer, it will develop slowly and from a scientific point of view there will be other options apart from surgery".

4. The fourth EC – *Encounters* – explained 11.56% of the lexical variance and highlighted patients' collection process of informal data mainly through friends. The most significant words in this cluster were "To talk" and "Friend" ("This friend of mine, friend of a friend, younger than me, he was diagnosed with prostate cancer […] by chance", "I signed up for the surgery waiting list before a friend of mine told me Wait, if you are not convinced you talk to the oncologist, it's still at the beginning, do not hasten, wait, in the meanwhile whether it should develop you gained some years, one, two", "Then I got in contact with two friends of mine who had already undergone these interventions"). In many cases, informal data collection was carried on by different acquaintances in the medical environment: "I know the oncologist, she's a friend of ours and she told me, I'll have you talk to the radiotherapist", "And then I promised myself I was going to hear another opinion. As such, I had a contact with the Prostate Cancer Program. I changed my mind also because in the meanwhile I talked to a friend of mine, an aesthetician, who told me something very odd", "I got in contact with this friend who told me, Look, you can come over here".

4. Discussion

The analyses of the interviews showed that the choice of active surveillance involves a complex decision-making process which can be characterized by ambivalence, conflicts and extensive need for adequate information. Patients could experience decisional conflict as each of the therapeutic/observational option presented risks and benefits that were not always straightforward and was associated with a certain degree of uncertainty.

The interviews provided a structured representation of what was discussed in previous literature (see for instance Mauri et al., 2009; Graffigna et al., 2011) and provided a more detailed picture of the decision making process that patients go through when called to face the double-edged responsibility of choosing an observational strategy.

The choice of AS is influenced by different people and events: patients are motivated to opt for AS, rather than radical therapies, based on the subjective evaluation of a number of factors that include medical information as well as contributes from their psycho-social context. The research underlines that patients try to get as much information as possible about their illness: the choice of AS could compared to a journey that patients, and their families, undertake to find a meaning to their diagnosis of cancer before they can feel ready to make a decision.

The role of the physicians they met and their attitude toward AS was reported as crucial by all the interviewed patients. This result was similar to what reported by other authors (Davison, Oliffe, Pickles & Mroz, 2009; Gorin, Soloway, Eldefrawy & Soloway, 2011), who highlighted that the specialists' description of the PCa was the most influential factor on men who chose AS.

The above-discussed results suggest that patient-physicians communication and patients' engagement are crucial factors in overcoming the barriers to the acceptance of AS. As other studies already underlined (Hibbard et al., 2004; Gruman et al., 2010) the engagement of patient is a crucial ingredient for the clinical success of a healthcare intervention. From this perspective more and more attention is claimed to the organizational characteristics of the intervention (in terms of relational, communicative, structural and technical ones) that can contribute to enhance patients' engagement and activation toward the clinical process (Barello, Graffigna & Vegni, 2012). In the case of AS this appear particularly crucial in order to improve patients' empowerment and to make them feel able to muster and lead their own process of care. We thus suggest that physicians should be involving patients in a process of shared decision-making and adopt decision aid tools (O'Connor et al., 2009), which may support patients in reaching a well-informed choice based on their personal values and psycho-social priorities. Multidisciplinary teams could provide the most adequate setting for facilitating the exchange of information about therapeutic/observational options between the physicians and the patient (Bellardita, Donegani, Spatuzzi & Valdagni, 2011; Magnani et al., 2012; Valdagni, 2011)

Acknowledgements

Multidisciplinary Clinic Team at Prostate Cancer Program, Fondazione IRCCS Istituto Nazionale dei Tumori, Milan; Foundation I. Monzino and Foundation ProADAMO Onlus for support to the project *Per un sentire condiviso: l'uomo e il tumore alla prostata*.

References

Associazione Italiana dei Registri Tumori & Associazione Italiana di Oncologia Medica (2011). *I numeri del cancro in Italia 2011*. Brescia: Intermedia.

Barello, S., Graffigna, G., & Vegni, E. (2012). Patient engagement as an emerging challenge for health-care services: mapping the literature by bibliometric analysis. *Nursing Research and Practice* (online publication ahead of print).

Bellardita, L., Donegani, S., Spatuzzi, A.L., & Valdagni, R. (2011). Multidisciplinary versus one-on-one setting: a qualitative study of clinicians' perceptions of their relationship with patients with prostate cancer. *Journal of Oncology Practice / American Society of Clinical Oncology*, 7 (1), 1-5.

Bul, M., van den Bergh, R.C., Rannikko, A., Valdagni, R., Pickles, T., Bangma, C.H., & Roobol, M.J. (2012). Predictors of unfavourable repeat biopsy results in men participating in a prospective active surveillance program. *European Urology*, 61 (2), 370-377.

Burnet, K.L., Parker, C., Dearnaley, D., Brewin, C.R., & Watson, M. (2007). Does active surveillance for men with localized prostate cancer carry psychological morbidity? *BJU International*, 100 (3), 540-543.

Cohen, H., & Britten, N. (2003). Who decides about prostate cancer treatment? A qualitative study. *Family Practice*, 20 (6), 724-729.

Cooperberg, M.R., Carroll, P.R., & Klotz, L. (2011). Active surveillance for prostate cancer: progress and promise. *Journal of Clinical Oncology / Official Journal of the American Society of Clinical Oncology*, 29 (27), 3669-3676.

Coulter, A. (2010). Do patients want a choice and does it work? *BMJ*, 341 (7780), 973-975.

Davison, B.J., Oliffe, J.L., Pickles, T., & Mroz, L. (2009). Factors influencing men undertaking active surveillance for the management of low-risk prostate cancer. *Oncology Nursing Forum*, 36 (1), 89-96.

Davison, B.J., So, A.I., & Goldenberg, S.L. (2007). Quality of life, sexual function and decisional regret at 1 year after surgical treatment for localized prostate cancer. *BJU International*, 100 (4), 780-785.

Ferlay, J., Parkin, D.M., & Steliarova-Foucher, E. (2010). Estimates of cancer incidence and mortality in Europe in 2008. *European Journal of Cancer*, 46 (4), 765-781.

Gambetti, R., & Graffigna, G. (2010). Exploring the concept of engagement in market research: a systematic analysis of the ongoing debate. *International Journal of Marketing Research*, 52 (6), 801-826.

Gilardi, S., & Lozza, E. (2009). Inquiry-based learning and undergraduates' professional identity development: assessment of a field research-based course. *Innovative Higher Education*, 34 (4), 245-256.

Goh, A.C., Kowalkowski, M.A., Bailey, D.E. Jr., Kazer, M.W., Knight, S.J., & Latini, D.M. (2011). Perception of cancer and inconsistency in medical information are associated with decisional conflict: a pilot study of men with prostate cancer who undergo active surveillance. *BJU International*, 110 (2b), E50-56.

Gorin, M.A., Soloway, C.T., Eldefrawy, A., & Soloway, M.S. (2011). Factors that influence patient enrollment in active surveillance for low-risk prostate cancer. *Urology*, 77 (3), 588-591.

Graffigna, G., Vegni, E., Barello, S., Olson, K., & Bosio, A.C. (2011). Studying the social construction of cancer-related fatigue experience: the heuristic value of Ethnoscience. *Patients Education and Counselling*, 82, 402-409.

Gruman, J., Rovner, M.H., French, M.E., Jeffres, D., Sofaer, S., Shaller. D., & Prager, D.J. (2010). From patient education to patient engagement: implications for the field of patient education. *Patient Education and Counseling*, 78, 350-356.

Hamdy, F.C. (2011). Long-term quality of life in prostate cancer. *The Lancet Oncology*, 12 (9), 832-833.

Heidenreich, A., Bellmunt, J., Bolla, M., Joniau, S., Mason, M., Matveev, V., & Zattoni, F. (2011). EAU guidelines on prostate cancer. Part 1: screening, diagnosis, and treatment of clinically localised disease. *European Urology*, 59 (1), 61-71.

Hibbard, J.H., Stockard, J., Mahoney, E.R., & Tusler, M. (2004). Development of the Patient Activation Measure (PAM): conceptualizing and measuring activation in patients and consumers. *Health Services Research*, 39, 1005-1026.

Jemal, A., Siegel, R., Ward, E., Hao, Y., Xu, J., Murray, T., & Thun, M.J. (2008). Cancer statistics. *CA: A Cancer Journal for Clinicians*, 58 (2), 71-96.

Klotz, L. (2012). Active surveillance for favorable-risk prostate cancer: background, patient selection, triggers for intervention, and outcomes. *Current Urology Reports*, 13 (2), 153-159.

Magnani, T., Valdagni, R., Salvioni, R., Villa, S., Bellardita, L., Donegani, S., & Zaffaroni, N. (2012). The 6-year attendance of a multidisciplinary prostate cancer clinic in Italy: incidence of management changes. *BJU International*, 110 (7), 998-1003.

Mauri, E., Vegni, E., Lozza, E., Parker, P.A., & Moja, E.A. (2009). An exploratory study on the Italian patients' preferences regarding how they would like to be told about their cancer. *Supportive Care in Cancer*, 17 (12), 1523-1530.

O'Connor, A.M., Bennett, C.L., Stacey, D., Barry, M., Col, N.F., Eden, K.B., Entwistle, V.A., Fiset, V., Holmes-Rovner, M., Khangura, S., Llewellyn-Thomas, H., Rovner, D. (2009). Decision aids for people facing health treatment or screening decisions. *Cochrane Database Systematic Reviews*, 8 (3), CD001431.

Pickles, T., Ruether, J.D., Weir, L., Carlson, L., Jakulj, F., & SCRN Communication Team (2007). Psychosocial barriers to active surveillance for the management of early prostate cancer and a strategy for increased acceptance. *BJU International*, 100 (3), 544-551.

Valdagni, R. (2011). Prostate cancer units: has the time come to discuss this thorny issue and promote their establishment in Europe? *European Urology*, 60 (6), 1193-1196.

Van den Bergh, R.C., Essink-Bot, M.L., Roobol, M.J., Schroder, F.H., Bangma, C.H., & Steyerberg, E.W. (2010). Do anxiety and distress increase during active surveillance for low risk prostate cancer? *The Journal of Urology*, 183 (5), 1786-1791.

Van den Bergh, R.C., Essink-Bot, M.L., Roobol, M.J., Wolters, T., Schroder, F.H., Bangma, C.H., & Steyerberg, E.W. (2009). Anxiety and distress during active surveillance for early prostate cancer. *Cancer*, 115 (17), 3868-3878.

Van den Bergh, R.C., Korfage, I.J., & Bangma, C.H. (2012). Psychological aspects of active surveillance. *Current Opinion in Urology*, 22 (3), 237-242.

Van den Bergh, R.C., Steyerberg, E.W., Khatami, A., Aus, G., Pihl, C.G., & Wolters, T. (2010). Swedish and Dutch sections of the European randomized study of screening for prostate cancer. Is delayed radical prostatectomy in men with low-risk screen-detected prostate cancer associated with a higher risk of unfavorable outcomes? *Cancer*, 116 (5), 1281-1290.

Van den Bergh, R.C., Vasarainen, H., van der Poel, H.G., Vis-Maters, J.J., Rietbergen, J.B., Pickles, T., et al. (2010). Short-term outcomes of the prospective multicentre "Prostate Cancer Research International: Active Surveillance" study. *BJU International*, 105 (7), 956-962.

Vasarainen, H., Lokman, U., Ruutu, M., Taari, K., & Rannikko, A. (2011). Prostate cancer active surveillance and health-related quality of life: results of the finnish arm of the prospective trial. *BJU International*, 109 (11), 1614-1619.

Emotional experiences of the community-dwelling with mild cognitive impairment and their families

Masako Nakano [1] **- Shinichi Sato** [2] **- Jun Nakahara** [2]

[1] *Department of Nursing, Osaka sin-Ai College*

[2] *Graduate School of Human Sciences, Osaka University*

nakano.rinro@gmail.com

Abstract

This study aimed to clarify the emotional experiences of a community-dwelling sample of elderly individuals with mild cognitive impairment and their families. The participants included an elderly man and his wife and an elderly woman and her daughter-in-law. Data were collected using semi-structured interviews and analyzed by using a qualitative inductive method. In total, 212 codes were extracted from the interviews and categorized into 37 sub-categories. Finally, we obtained the following 4 categories: Bewilderment regarding memory decline, Avoidance of neighborly relations, Fluctuation of confidence in the family, and Desire to maintain a healthy life.

Keywords: Mild cognitive impairment; Memory decline; Luctuations interaction with the family member; Therapeutic intervention

1. Introduction

Memory clinics provide services for the diagnosis and treatment of early-stage dementia, including Alzheimer's disease, in late life. However, the care needs of the elderly with mild cognitive impairment (MCI) have also increased recently (e.g., Kajitani et al., 2002; Furukawa et al., 2006; Iwatubo et al., 2009; Suzuki et al., 2011; Nomura et al., 2012). Peterson et al. (1999) discuss an MCI stage referred to as the "gray zone", and people who progress

from MCI to dementia are included in this zone (Kodama, 2011). Elderly individuals with MCI become aware of a functional decline in memory and of the obstacles that MCI presents to their ability to complete activities of daily living (ADLs) by themselves (Boden, 1997). They are also troubled by jitters (e.g., Geda et al., 2008; Palmar et al., 2007) and sleeplessness (e.g., Rozzin et al., 2008). Their families, however, are puzzled over the changes they observe in their loved ones, wish to seek third-party help (Yasutake et al., 2007), and prefer face-to-face consultations until they are convinced that the diagnosis is accurate (Kimura et al., 2011).

Little research has been conducted on the subjective experience of the community-dwelling elderly with MCI and the psychological care provided by their family to them. The present study aimed to examine the emotional experiences of elderly individuals with MCI and their families in order to determine potential strategies for therapeutic intervention.

2. Methods

The design of this study was based on empirical phenomenology conducted through interviews. Participants were two elderly individuals (one male and one female) and one member of their respective families.

In the early autumn of 2010, an interview was conducted with the participants after informed consent was obtained from them. The study was carried out in accordance with the ethical standards.

Data were collected using a semi-structured interview. Participants were asked the following question: "Please talk about the things that are troubling you". The interviewer listened to the participants describe their difficulties and sometimes asked the participants to provide additional details if the interviewer could not understand what was being said. The stories from the participants and their family members were tape-recorded, and word-by-word records from the conversations were carefully extracted. Meaningful sentences were extracted from the recorded interviews in order to create transcription records. Transcriptions were grouped based on similar characteristics, and all codes were compiled into subcategories. Further categories were created based on similarities. Each category was named based on the meaning of the particular category. During the analysis, two nursing science teachers and a psychologist carried out several discussions in order to ensure the reliability and validity of the interview content.

3. Results

The first participant, Hisashi (temporary name), was a 74 year old man who retired from his job as a car repair industry president 10 years ago. *Hisashi* visited the interview room with his wife, *Emiko* (temporary name). The second participant, *Matsuko* (temporary name), was an 80 year old woman who had been the manager of a textile shop for almost 50 years. Matsuko came to the interview room with her daughter-in-law, *Kazuko* (temporary name), on another day.

The recording time was 37 minutes for the first participants and 65 minutes for the second participants. In total, 212 codes were extracted from both word-by-word records. The codes were then sorted into 27 subcategories. Finally, 5 categories were extracted from these subcategories after a unification process.

3.1. Bewilderment regarding memory decline

Two participants and their respective family members had difficulty accepting the fact that degeneration of memory was occurring and that this degeneration had become an obstacle. Participants did realize that there was some memory decline, and a dilemma arose because of impediments to their familial roles. Emiko noticed that the cause of her husband's symptom deterioration was due to a mistake in the use of his sleeping medication. She wanted her husband to correct his method of taking the medication. On the other hand, Kazuko displayed an understanding of her mother-in-law's difficulties and told Matsuko not to mind them:

Hisashi: "I am irritated by not being able to remember yesterday. I became particularly terrible recently. I have gradually worsened. It has become hard for me to do mental arithmetic. I get tired of it when I cannot do it".

Emiko: "The biggest problem is the sleeping drug, after all. He almost sleeps for 24 hours. He should not have taken a sleeping drug during the daytime".

Matsuko: "I go to Kazuko's place to do something. However, I forget why I went there because I am thinking about other things. I buy the wrong things when I am shopping. I think, 'Oh my god', but I cannot do anything about it, so I give up".

Kazuko: "I have the same experience. I turned 60 years old this year. I think to myself, 'What would I come to the second floor for?'. When I go back down to the first floor, I remember why I needed to go to the second floor".

3.2. Avoidance of neighborly relations

A tendency to avoid social participation was observed in both participants' interviews. Hisashi often worried about telephone calls from a co-worker. Emiko felt limited in her ability to provide friend-related maintenance for her husband and suggested that Hisashi give it up. Matsuko was puzzled and surprised that her neighbors would talk to her when she went outside; Matsuko did not want to go outside because of it.

Hisashi: "I have several telephone calls from 40-year co-workers every day, but I don't remember with whom I talked. I get confused. Even if I promise something, I cannot remember what I promised. I cannot speak well because I get tongue-tied".

Emiko: "My husband says the same thing several times. So, everybody thinks he is strange. I say, 'Because you trouble everybody, stop the telephone call'".

Matsuko: "I am asked by neighbors on the road, 'It has been a long time; how are you?'. I think, 'Who is she?'. I feel unpleasant when meeting my neighbors. I just walk around my house instead".

3.3. Fluctuation of confidence in the family

Hisashi has a sleep disorder, and he did not agree with his wife in regards to the method for taking his sleeping medication. Emiko felt a loss of familial confidence because of her husband. Without hesitating, Matsuko talked about dissatisfaction with her husband, and she became emotional at times. However, both participants spoke about the importance of their family and said that they strongly expected that the family would remain safe. The participants were somewhat hopeful when discussing the family.

Emiko: "I asked my husband, 'What is the matter with you?'. He said, 'Where did you take the sleeping medicine?'. He suspects me first. I said, 'I never did such a thing'. He does not remember that he took it, himself".

Matsuko: "My worry is that I am going to be despised by my husband. Nobody hurts my heart like him […]. My husband says, 'Why were you disregarding this for such a long time?'. My head has finally become a little unclear. I apologized to him immediately".

3.4. Desire to maintain a healthy life

The participants had pride in the past, and they desired to maintain a healthy life. Actions related to a sense of life protection as a way to boost their health were evident in their daily living. Hisashi drove a car and confirmed his health

by doing crisis control. Emiko was not able to stop her husband when she felt that it was dangerous for him to drive. Matsuko went out to buy food once a day, and she prepared meals via a simple menu three times a day. Kazuko was able to manage a kitchen fire because she was monitoring Matsuko.

Hisashi: "I drive the car. My feelings change when I close the door, wear the seat belt, and start up the engine […]. I have not gotten sick until now. My body did not have any problems, and I have maintained the car before. My feelings settle down when I am driving".

Emiko: "He does not hear what another person says. He tells me, 'Don't worry'. I am anxious until he comes home. When he is tired, I drive the car, too […]".

Matsuko: "I go out shopping or walking once a day […]. I drink a lot of water […]. I cook a brief dish for my husband every day. I cannot make complicated dishes […]. I can forget to buy something, but I do the shopping every day, by myself. However, I do not forget the name of the cake. I go to a family doctor alone".

Kazuko: "When I did the shopping or everything else for her, she stopped doing anything. I worried that I helped create her dementia. If a gas ring is turned on, I put it out. I felt that it was dangerous for her to cook for about two years".

4. Discussion

Characteristics of the psychological experience were extracted as four categories, Bewilderment regarding memory decline, Avoidance of neighborly relations, Fluctuation of confidence in the family, and Desire to maintain a healthy life. These categories were experienced as familial interactions that were in constant fluctuation. For example, our two participants with MCI were at a loss for being able to understand the degeneration of their memory; however, they continued a desire to maintain a healthy life. Furthermore, the relationship with the family was exposed to crises and expressed with negative words. This is not to say that, at times, interactions with the family were expressed affirmatively and supportively. Therefore, we suggest that Interaction with the family member and Fluctuations are core categories (Figure 1).

Conversely, the seriousness of certain problems within the family was also evident. The families were suspicious of the effects of drug treatments, and they suffered from issues related to crisis management. The families had a sense of insecurity due to a worsening of MCI symptoms. This led to feelings of a crisis of confidence within the family relationship. The family mem-

bers hoped that their loved ones with MCI would be safe. Although caregiver burden and psychiatric morbidity levels are lower when dealing with MCI as compared to dementia, MCI caregivers already begin to experience distress in association with elevated caregiving burden (i.e., Garand et al., 2005).

Throughout these interviews, the importance of understanding the psychology of elderly individuals with MCI, and maintaining and improving their quality of life, became clear. These results suggest that care is necessary not only for the individual with MCI but also for the family members who provide care.

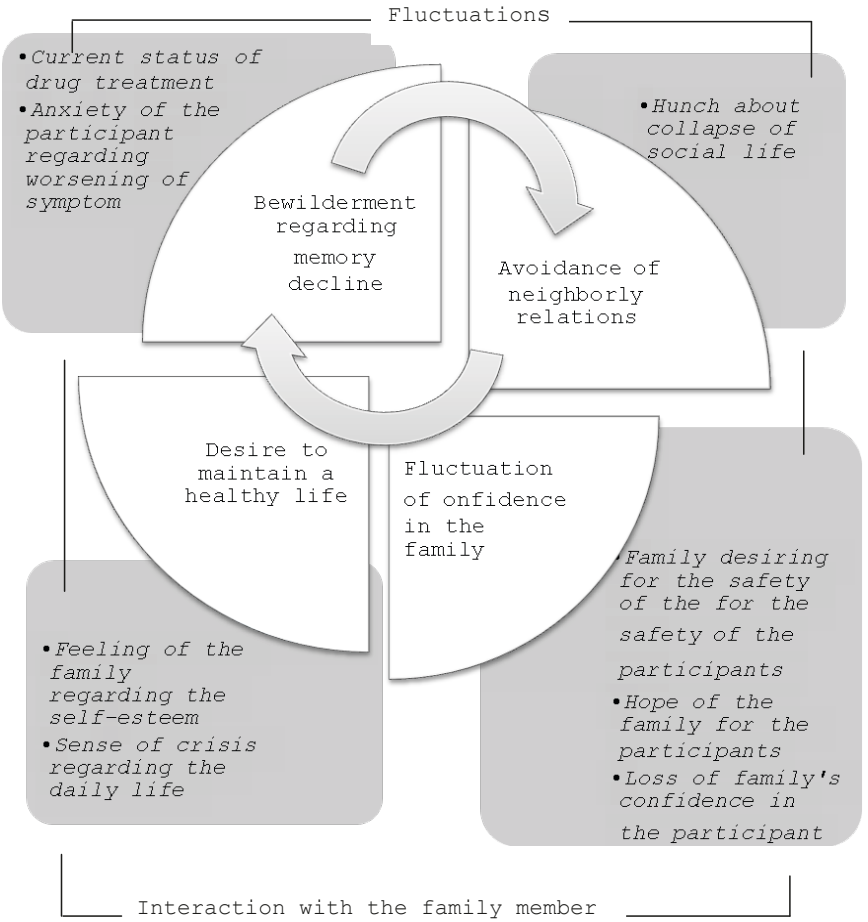

Figure 1. Conception diagram by each category connection

5. Conclusion

The interview suggested that both individuals with MCI and their respective family members were suffering this disease together. A care system for the elderly with MCI needs to include provisions for helping both patients and caregivers deal with this disease.

References

Boden, C. (1997). *Who will I be when I die?* Sydney: Harper Collins Publishers.

Furukawa, Y., Nakamura, S., & Saito, A. (2006). Diagnosis program of dementia for outpatients in Yokohama Comprehensive Care Continuum: patients of 12 years. *Japanese Journal of Geriatric Psychiatry*, 17, 326-331.

Garand, L., Dew, M.A., Eazor, L.R., Dekosky, S.T., & Reynolds, C.F. (2005). Caregiving burden and psychiatric morbidity in spouses of persons with mild cognitive impairment. *International Journal of Geriatric Psychiatry*, 20, 512-522.

Geda, Y., Roberts, R., Knopman, D., Petersen, R., Christianson, T., Pankratz, V., et al. (2008). Prevalence of neuropsychiatric symptoms in mild cognitive impairment and normal cognitive aging: population-based study. *Archives of General Psychiatry*, 65, 1193-1198.

Iwatsubo, T. (2009). Japanese Alzheimer Disease Neuroimaging Initiative project (J-ADNI). *Geriatric Medicine*, 47, 73-76.

Kajitani, K., Nakagawa, Y., Ogomori, K., Ichimiya, A., Kawashima, N., Urabe, M., et al. (2002). The establishment of a memory clinic at Kyushu University Hospital: looking back one year after its establishment. *Japanese Journal of Geriatric Psychiatry*, 13, 1063-1069.

Kimura, K., Aida, K., & Koizumi, M. (2001). Process of the family of elderly with dementia to induce the patient to receive a consultation at Memory Clinic: encouragement and barrier to consultation. *Journal of Japanese Society for Dementia Care*, 10, 53-67.

Kodama, N., & Kawase, Y. (2011). Research on conversion from amnestic mild cognitive impairment to Alzheimer's disease. *Japanese Journal of Geriatric Psychiatry*, 22, 717-722.

Nomura, T., Ishii, C., Mastumoto, S., Nemoto, R., Wakamatsu, N., Ishiwta, A., et al. (2012). A model for early detection of dementia: analysis of questionnaires answered by users of the Community Consultation Center for Citizens with MCI and Dementia. *Journal of Japanese Society for Dementia Care*, 11, 544-550.

Palmar, K., Berger, K., Monastero, R., Winbladal, B., Bäckman, L., & Fratiglioni, L. (2007). Predictors of progression from mild cognitive impairment to Alzheimer disease. *Neurology*, 68, 1596-1602.

Petersen, R.C., Smith, G.E., Waring, S.C., Ivnik, R.J., et al. (1999). Mild cognitive impairment: clinical characterization and outcome. *Archives of Neurology*, 56, 303-308.

Rozzini, L., Vicini, B., Conti, M., Delrio, I., Borroni, B., Trabucchi, M., et al. (2008). Neuropsychiatric symptoms in amnestic and nonamnestic mild cognitive impairment. *Dementia and Geriatric Cognitive Disorders*, 25, 32-36.

Suzuki, H., Yasunaga, M., & Fujiwara, Y. (2011). Validation of the Japanese version of the Montreal Cognitive Assessment to evaluate the time course changes of cognitive function. *Japanese Journal of Geriatric Psychiatry*, 22, 211-218.

Yasutake, A., Igarashi, K., Fukushima, R., & Kodama, T. (2007). A family's experience of the elderly with dementia: from the onset of symptom to being diagnosed. *Journal of Japan Academy of Gerontological Nursing*, 12, 32-39.

Mapping online peer exchanges on diabetes

Chiara Libreri - Guendalina Graffigna

Faculty of Psychology, Catholic University of Sacreted Heart of Milan, Milan, Italy

chiara.libreri@unicatt.it

Abstract

Diabetes is a serious chronic condition affects the 10% of the world population; in order to avoid consequences, patients need to be able to self-manage their care & cure. Peer support groups help diabetic patients to improve their self-care; today they are simplified by the use of the Internet and Web 2.0. Even if the role of this medium into facilitate peer exchanges is well established, less attention is given to the way in which Web 2.0 contexts (e.g.: different Web 2.0 applications) could facilitate or inhibit the exchanges. The aim of this study is to understand the role of Web 2.0 contexts into shape online exchanges about diabetes in Italy. According to an ethnographic perspective, a systematic exploration of sites hosting exchanges about diabetes was developed. Findings show a map of different Web contexts and different online exchanges about diabetes, highlighting their main features and underlining relevant insights for the health expert field.

Keywords: Online patients exchanges; Web 2.0; Diabetes; Qualitative research

1. Introduction

Diabetes is a chronic disease that affects around the 10% of the world population (WHO, 2012): across the world around 220 million people have diabetes (Kneck, Klang & Fagerberg, 2011). It has consequences (such as stroke or renal failure) that can converge on the death of the patient (WHO, 2012). This means that diabetic patients have to learn to self-manage their daily care and lifestyle (Kneck, Klang & Fagerberg, 2011).

According to this perspective, patient empowerment (Anderson & Funnell, 2010) and patient engagement (Barello, Graffigna & Vegni, 2012)

are key processes necessary to make diabetic, and more in general chronic, patients able to manage their health and to cope with chronic disease and their consequences, by promoting and supporting daily self management of several aspects of life, such as diet, physical activity, but also stress or time management. Peer groups are useful in managing chronic illness and diabetes in particular because they give the opportunity for diabetic patients to receive feedback and suggestion about their care behaviours (Christie et al., 2008).

The Internet has been used successfully in the diabetes management; it gives to patients the possibility to become increasingly independent in the process of information-seeking and decision-making about self-care (de Boer, Versteegen & van Wijhe, 2007). Moreover, the advent of Web 2.0 make possible to patients not only to receive information but also to construct useful knowledge and make them main characters of their care management. In fact the Web 2.0 is "[…] the transition of use of the Internet from primarily information receiving to information generating […] Web 2.0 tools are seen by some as a revolutionary leap in the ability to manage, remix, and transform health information" (Turner et al., 2011,). In practice, it facilities peer-to-peer support in diabetes care management throughout the online exchanges (Greene et al., 2010). Web 2.0 gives diabetic patients the possibility to participate in sharing and construction of knowledge about their illness, their care (Nambisan & Nambisan, 2009) and their identity (Arduse, 2011).

Literature has well established that online peer exchanges between diabetic, and more in general chronic patients, have three main aims /functions:

- to find information (Hoffman-Goetz, Donelle & Thomson, 2009);
- to reach emotional and social support (Barrera et al., 2002);
- to share experience, opinions and knowledge (Nambisan & Nambisan, 2009).

The Web 2.0 is composed by a variety of applications or tools such as blogs, forums, wikis, podcast, social networks, and many of them has been used to back online diabetic patients exchanges – such as, forums (Hoffman-Goetz, Donelle & Thomson, 2009), blogs, social networks (Greene et al., 2010).

Even if it's clear that all this applications are characterized by different technical features, such as programming features or allowed activities (Holt, 2011) and a growing attention is given to the social features, such as trust (Riegelsberger, Sasse & McCarthy, 2005), social presence (Ning Shen et al., 2007), type of exchanges, less attention is given to the way in which these specific features may shape online exchanges; in particular it is not clear how different Web 2.0 contexts could facilitate or inhibit the exchanges and what consequences the Web 2.0 contexts could take on exchanges features and type and on the exchanges contents, in particular in chronic and diabetic patients' online exchanges.

According to this premise, this contribute is aimed to understand what is the role of Web 2.0 contexts into shape online peer exchanges about diabetes in the Italian context, focusing in particular on:

1. If and how different Web tools and their features may define different online peer exchanges?
2. Who are the different actors involved in those exchanges?
3. What the differences in the contents dealt in the exchanges?

2. Method

This is an exploratory qualitative research designed according to an ethnographic perspective (Mayan, 2009).

A sample of Web 2.0 sites was found using the main Italian search engines: Google, Google discussions, Google Blog and Yahoo. Additionally, we included Facebook search engine as it is the main social network in Italy (sources: http://www.pandemia.info/2009/11/19/i-social-network-piu-popolari-in-italia-secondo-il-censis.html; http://www.italianbloggers.it/8800/elenco-dei-social-network-piu-popolati-della-rete). The used keyword for the search is the Italian word for Diabetes (diabete) and the research was performed in the 2011 (from february to September). The first 100 references for each search engine were considered.

The analysis of the site was composed by two main phases focusing on:

1. *Sites features*, such as Web 2.0 applications type, information and trust indexes about the site itself and the participants, number and consistency of exchanges and people. The grid was both theory (e.g. trust toward the site derived from Orizio et al., 2010) and data driven. The analysis was organized using ATLAS.Ti software.
2. *Exchange* features: (a) exchange contents, (b) participants in the exchange. The analysis was organized using ATLAS.Ti software. Moreover a content textual analysis was provided using T-Lab software.

3. Main results

Online peer exchanges about diabetes in Italy seem to be a relevant phenomenon. Table 1 describes the sample of found sites, it explains how many sites and why have been analyzed and it shows frequencies and percentage of the different Web 2.0 applications which support the exchanges (Table 1).

Table 1. Sample description

Total of references found: 344				
Total of references not considered	188	Total of references analyzed	156	%
No exchange activities allowed	84	Blogs	77	51
Outside the chosen period of time	79	Personal blogs	14	9
Sites dealing with other topics	20	Forums	40	25
Sites/exchanges not in Italian	5	Chats	1	0,5
		Social networks: pages	12	8
		Social Networks: groups	8	4
		Q&A sites	4	2,5

A variety of online applications, thus, support online exchanges about diabetes; although blogs and forums are the most used ones. But technical aspects seem to be not enough to explain differences into online peer exchanges about diabetes.

The detected variety of online peer exchanges about diabetes can be described by a conceptual map which articulates them according to Web 2.0 applications, actors involved and main contents of the exchanges (see Figure 1). In particular the map is created by the following two axes.

Horizontal axis: Legitimation of the knowledge produced in the exchanges. This axis describes the way in which the contents and the knowledge produced in the exchanges are legitimated (i.e. the reliability and credibility of the posts and exchanges contents). On the negative pole are positioned sites where there is a vertical legitimization of the exchange contents; practically, an institutional expert (a health professional, the blog manager …) guarantees for the produced content in the site/exchange. The contents produced mainly with therapies and cure. On the other side, there is a horizontal legitimization of the exchange contents: the credibility of contents shared is guaranteed by the people who participate in the online exchanges. In this case the "expert" is someone who experienced with the topic dealt in the exchange. Topics of these exchanges concerns diabetes related activities and feelings.

Vertical Axis: Relational aim of the exchanges. The vertical axis describes the type of linkage sought by people who takes part in the exchange. On the positive pole are positioned those sites where people are aimed to spread information and news within the biggest network of people as possible.

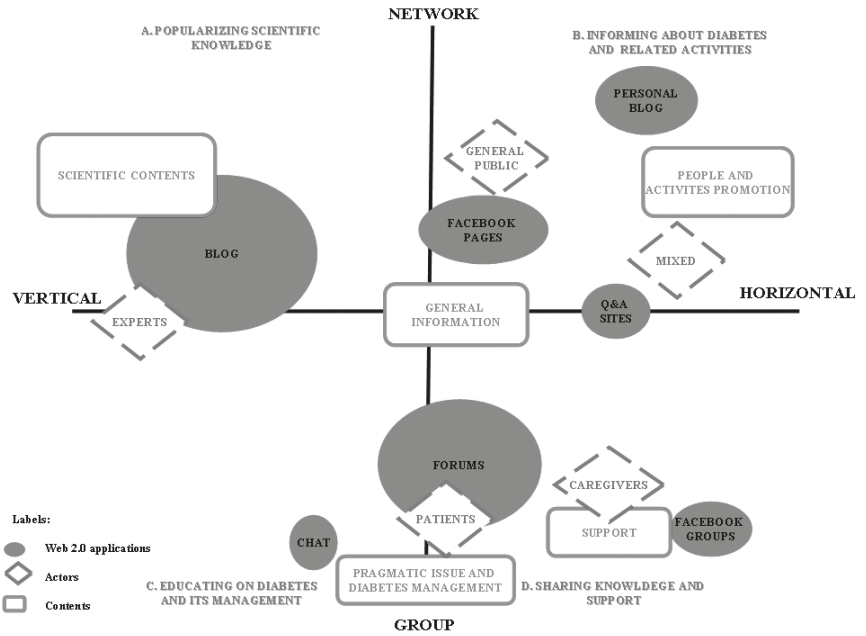

Figure 1. Online diabetes peer exchanges map

In practice, in these sites the exchange activity is limited to post and forward to a reference network (that may change according to the topic), without adding other comments or knowledge. In terms of contents, this pole deals mainly with a public sphere of diabetes: practically people are interested to diffuse information about diabetes aspects of topical interest, such as scientific innovation, activities of a group or a patients association), diabetes prevention campaign … The other pole is characterized by sites in which people seeks for affiliation and feeling of group belonging. In this case, the exchange activities, mainly asking for and sharing opinion, and experiences, are oriented toward that particular group.In these sites the contents of the exchanges are mainly focused on the practical, emotional and social aspects of diabetes.

This conceptual map articulates four prototypes of online exchanges on diabetes:

1. *Popularizing scientific knowledge*: post and exchanges in these sites are aimed to spread information about diabetes toward the Web, trying to reach the main number of people. In terms of Web 2.0 applications, this

area is covered by blogs. In terms of contents, blogs are used to diffuse information current affairs news on diabetes new therapies, and research (e.g.: "Association between diabetes type 1 and enterovirus"). People do not use blogs to discuss (only 8 blogs presented discussions after the first post), but to share information (all blogs propose tools to share post and news by email and on other blogs or social networks). In terms of actors, this is the realm of the institutional experts (mainly physicians and nutritionists, but also health communication experts). They guarantees for trust and credibility of the contents. In facts, sites in this area are furnished by many classic trust indexes like logos, copyrights, and contact information.

2. *Informing about diabetes and related activities*: in this area, the aim of posts and exchanges is to show information about the diabetes itself or a specific person or association strictly linked to the diabetes. In terms of Web 2.0 applications, this area is mainly covered by social network pages and personal blogs (and in part by Q&A sites), who work really similar to blogs: someone (a person or a group) posts something about diabetes but there are few interactions on the topics. Moreover less activities of sharing on other sites or networks are allowed by this site. The aim is merely informative. In terms of contents, post and exchanges refer to: (1) a person (personal blog) or news about projects, associations or organizations to inform/update people that are interested in it. Substantially they seem display windows: people and organizations use them to show their activities and their interest to the world. For example: the BCD (buon compenso diabete) Facebook page is about a temporary project for diabetes care. The Fondazione Italian Diabete Facebook page is mainly a place where people (e.g., administration, other associations, patients) share information about, books, conferences, and scientific papers. (2) Giving/receiving information about diabetes in general (mainly in Q&A sites) ("What is the difference between diabetes 1 and diabetes 2?"). This area is not characterized by one type of actors but the exchanges usually present mixed actors, especially because people, who is not directly involved in diabetes and its care, is looking for general information.
3. *Educating on diabetes and its management*: this is the area where health experts and lay people (patients and general public) meet. In terms of Web 2.0 applications, this area is covered by some forums and less blogs where recognized expert (such as practitioners, nutritionists, psychologists) discuss with people, explaining what diabetes is or what are is symptoms, and with patients, addressing them towards diagnosis and cure. It's evident that when the expert participates in the discussion, the exchange become dyadic and polarized (i.e. expert-patient) and the peer exchange

tends to be inhibited. In terms of contents, the exchanges are focused on *cure & care* of diabetes.

4. *Sharing knowledge and support*: the sites in this area host exchanges aimed to discussion and sharing opinions, experiences, emotions and knowledge between people recognized as qualified (mainly patients or caregivers) to say something about the topic. In terms of Web 2.0 applications, this area is covered by forums and Facebook groups. They support a variety of exchange activities oriented to the group itself and not to other networks: not only to post experiences and comments, but also to express appreciation for other participants' messages (many forums have tools to express that people like others' comments or to thank or to quote other people's words). In terms of actors, this area is domain of patients and caregivers and the legitimation of knowledge is provided by the expertise that they have in the diabetes field. For this reason, sites in this area provide a lot of indicators about other participants. For example, in all the forums, enrollment is mandatory for participation; moreover in forums is usually possible to see each other's profiles (26 sites), and is easy to find exchange where people share similar interests (e.g., swimming) (33 sites) or recall prior conversations/discussions (6 sites). A great example of the sites in this area is "Mamme e diabete" Facebook group where caregivers (mothers) participate in the discussion in order to improve their children care and to support each others. In terms of contents, the focus is on a private sphere of diabetes concerning mainly: the daily management of diabetes and all the topic related (devices, food …) ("Try to control in the wizard bolus settings what values the device has and maybe you can high them up, or check how much activity time you set for your insulin […]") and the emotional and social support ("To talk here is different … We totally understand each other … without seeing us … !!!!!").

4. Discussion and conclusive remarks

This study showed the variety of online peer exchange about diabetes retrievable in the Italian context. The differences in these exchanges are not assignable only to the technical aspects of Web 2.0 application that support them, but to a mix of technical and social components. In particular two psychosocial dimensions (across Web 2.0 applications) seem to rule the variation of online peer exchanges. The first psycho-social dimension refers to the process of "legitimation of the knowledge produced in the exchanges". The negative pole of this dimension concerns a traditional vertical model of knowledge

legitimation, where an expert proposes institutionalized knowledge to lay people. Referring to the literature on the topic, this model is really similar to the concept "knowledge transfer" (Ekberg et al., 2008). At the opposite side, it's possible a horizontal way of knowledge legitimation, in which lay actors are experts, since they "experienced the disease". Thanks to Web 2.0 development, the topic of lay or patient "expertise" is gaining relevance into health studies, (Civan et al., 2009).

The second psycho-social dimension refers to the "Relational aim of the exchanges": network or group oriented. This dimension opposites processes aimed at knowledge diffusion, in which "the goal […] is to disseminate knowledge in the best possible way" (Baez et al., 2010) and online exchanges aimed at sharing and participating in a discussion within a particular group of reference. The literature about online patients exchanges on diabetes is mainly focused on the exchanges happening in this second area (sharing in a specific group), because they are really similar to peer-to-peer support exchanges (Barrera et al., 2002), without considering why those exchanges are happening in that specific site and how the Web 2.0 contexts may shape them.

Even if health literature focuses on group oriented exchanges, we found other types of exchanges oriented not only to the sharing of the knowledge, but also oriented by other aims, such as the spreading of information. Moreover, these exchanges involve not only patients but also caregivers and the general public. It will be necessary to deepen the role and the needs of these actors.

According to a pragmatic perspective, this study states the importance to consider Web 2.0 not as a whole and unique context: in the Web 2.0 different contexts have different technical and social aspects and may support different online exchanges. This study presents a preliminary description of the ways in which different online contexts shape the online exchanges and further research will clarify and determine the role of each features of the context into configure the exchanges. For now, it's clear that it's possible to choose and construct different Web contexts, both for their technical and social aspects in order to reach different aims (e.g. to diffuse information or to provide peer support) and different targets (e.g. patients, caregivers, general public …). As already said, it will be necessary to deepen what are the ingredients that allow configuring different Web contexts.

References

Anderson, R., & Funnell, M. (2010). Patient empowerment: myths and misconceptions. *Patient Education and Counselling*, 79 (3), 277-282.

Arduse, L. (2011). Warp and weft: weaving the discussion threads of an online community. *Journal of Technical Writing and Communication*, 41 (1), 5-31.

Baez, M., Mussi, A., Casati, F., Birukou, A., & Marchese, M. (2010). Liquid journals: scientific journals in theWeb 2.0 era. In: Hunter, J., *Proceedings of the 10th annual joint Conference on digital libraries*. New York: ACM, pp. 395-396.

Barello, S., Graffigna, G., & Vegni, E. (2012, in press). Patient engagement as an emerging challenge for health-care services: mapping the literature. *Nursing Research and Practice.*

Barrera, M., Glasgow, R.E., McKay, H.G., Boles, S.M., & Feil, E.G. (2002). Do Internet-based support interventions change perceptions of social support? An experimental trial of approaches for supporting diabetes self-management. *American journal of Community Psychology*, 30 (5), 637-654.

Christie, D., Romano, G.M., Thomposon, R., Viner, R.M., & Hindmarsh, P.C. (2008). Attitudes to psychological groups in a pediatric and adolescent diabetes service – implications for service delivery. *Pediatric Diabetes*, 9 (4), 388-392.

Civan, A., McDonald, D.W., Unruh, K.T., & Pratt, W. (2009). Locating patient expertise in everyday life. In: *Proceedings of the International ACM SIGCHI Conference on supporting group work*, pp. 291-300.

de Boer, M.J., Versteegen, G.J., & van Wijhe, M. (2007). Patients' use of the Internet for pain-related medical information. *Patient Education and Counseling*, 68 (1), 86-97.

Ekberg, J., Ericson, L., Timpka, T., Eriksson, H., Nordfeldt, S., Hanberger, L., & Ludvigsson, J. (2008). Web 2.0 systems supporting childhood chronic disease management: design guidelines based on information behaviour and social learning theories. *Journal of Medical Systems*, 34 (2), 107-117.

Greene, J.A., Choudhry, N.K., Kilabuk, E., & Shrank, W.H. (2010). Online social networking by patients with diabetes: a qualitative evaluation of communication with Facebook. *Journal of General Internal Medicine*, doi: 10.1007/s11606-010-1526-3.

Hoffman-Goetz, L., Donelle, L., & Thomson, M.D. (2009). Clinical guidelines about diabetes and the accuracy of peer information in an unmoderated online health forum for retired persons. *Informatics for Health and Social Care*, 34 (2), 91-99.

Holt, C. (2011). Emerging technologies: Web 2.0. *Health Information Management Journal*, 40 (1), 33-35.

Kneck, A., Klang, B., & Fagerberg, I. (2011). Learning to live with illness: experiences of persons with recent diagnoses of diabetes mellitus. *Scandinavian Journal of Caring Sciences*, 12, doi: 10.1111/j.1471-6712.2010.00864.x.

Mayan, M. (2009). *Essential of qualitative inquiry*. Walnut Creek, CA: Left Coast Press.

Nambisan, P., & Nambisan, S. (2009). Models of consumer value cocreation in health care. *Health Care Management Review*, 34 (4), 344-354.

Ning Shen, K., Yan Yu, A., & Khalifa, M. (2007). Knowledge contribution in virtual communities: accounting for multiple dimensions of social presence through social identity. In: *Proceedings of the Pacific Asia Conference on Information Systems (PACIS)*. Paper 98.

Orizio, G., Schulz, P., Gasparotti, C., Caimi, L., & Gelatti, U. (2010). The world of e-patients: a content analysis of online social networks focusing on diseases. *Telemedicine and e-Health*, 16 (10), 1060-1066.

Riegelsberger, J., Sasse, M.A., & McCarthy, J.D. (2005). The mechanics of trust: a framework for research and design. *International Journal of Human-Computer Studies*, 62*,* 381-422.

Turner, A., Kabashi, A., Guthrie, H., Burket, R., & Turner, P. (2011). Use and value of information sources by parents of child psychiatric patients. *Health Information and Libraries Journal*, 28 (2), 101-109.

World Health Organization (2012). *Chronic diseases. World Health Organization.* Retrieved 10 October, from http://www.who.int/topics/chronic_diseases/en/.

Nursing homes: engaging patients and staff in healing garden design through focus group interviews

Giulio Senes [1] - **Natalia Fumagalli** [1]
Rosella Crippa [2] - **Francesca Bolchini** [3]

[1] *Department of Agricultural and Environmental Sciences, University of Milan, Italy*

[2] *Agronomist*

[3] *Psychologist*

giulio.senes@unimi.it

Abstract

Patient-specific gardens can provide general benefits related to the restorative effects of nature and respond to the specific needs of a particular patient population. These needs are to be considered in the design of outdoor space for healthcare. Our goal was to design a patient-specific garden for elderly people who live in Nursing Homes and Adult Day Services (RSA Famagosta, Milano). A participatory design process was used through the organization of focus groups. A focus group is a form of qualitative research in which a group of people are asked about a topic. Focus groups allowed us to study residents and staff in a more natural setting than a one-to-one interview. With this approach, users work closely together to create a program that has been implemented by landscape architects to design a patient-specific garden. The participatory process involving designers and clinical staff and residents has been appreciated because the users felt involved in the decision process. Focus group approach has proved to be useful to provide information ohealing garden user needs: the findings were useful to draw design guidelines that has been incorporated into the "garden design".

Keywords: Healing garden; Focus group; Content analysis; Qualitative approach

1. Introduction

The interest in healing gardens has rapidly increased around the world in the last 20 years, both from the practical and scientific point of view. Professions and researchers with very different backgrounds are approaching with this theme, exploring different areas of interest such as design principles, design implication of health and well-being, how to measure the health benefits of healing gardens, how to design patient-specific healing gardens, etc. However, how we define a "healing garden"? Do all agree with its meaning? Do all use the term "healing garden" to indicate the same thing?

Everyone thinks to know what a garden is and what "healing" means in relation to gardens: in this way is difficult, sometimes, to be understood. In fact, a garden can be "healing" because it is attached to a healthcare facility or because in some way it helps the healing process or because it is part of a process of care or because it is a place of care or simply because it is a garden. In this way, all the gardens are "healing", and it is partly true, but when we speak about "healing gardens" we speak about something more specific: a garden specifically designed to be healing. Design is the key issue.

In this sense the healing garden concept perfectly meets the World Health Organization definition of "health": "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1948). Healing may be said to be a process that promotes overall well-being (Cooper, Marcus & Barnes, 1999): it is important that the illness is cured (from a medical point of view) but it is also important the individual experience of a personal feeling of recovery (Stigsdotter & Grahn, 2002).

It takes a change of mindset: from bodies to lives, from the "person-as-a-patient" to the "patient-as-a-person" view (Robinson, 1939; Ramsden, 1999). Modern healthcare facilities are designed almost exclusively for the treatment of diseases but the quality of the designed environment is in direct relation with health. We must work for "a world where every hospital, health clinic, treatment center, doctor's office, and residential care facility is designed to improve both the quality of care and outcomes for patients, residents, and staff" (The Center for Health Design, 2012). The impact of the physical environment on people's health and well-being is a research topic for different research disciplines, such as medicine, environmental psychology and landscape architecture (Stigsdotter & Grahn, 2002). Each discipline focuses on its own aspects, while trying to integrate more and more with the others.

In which way healing garden can benefit people? What people have to do in the garden in order to have benefits? Healing gardens can accommodate all users, patients (of all ages and with all kinds of diseases), visitors and staff, to

make different types of activities (from just sitting on a bench to take a walk, to do gardening). It is like a scale with two poles: from an extreme passive experience of the garden to an active one like horticultural therapy, that uses cultivation of plants as a therapeutic activity (Stigsdotter & Grahn, 2002). In the reality, often we can find a balance between "just being in the garden experiencing it and working with gardening" (Stigsdotter & Grahn, 2002).

The positive effects on health of experience and use of green outdoor environment are well documented (Cohen-Mansfield & Werner, 1998; Küller & Wetterberg, 1996; Rodiek, 2002; Ulrich et al., 1991; Ulrich, 1984 and 1999). Healing gardens can benefits people reducing stress (Adevi & Lieberg, 2012; Ulrich et al., 1991; Van Den Berg & Custers, 2011), mood (Rodiek, 2002), and the treatment costs (lower consumption of medicines and less permanence in healthcare facilities) (Ulrich, 2001 and 2002); and increasing the patient autonomy (Namazi et al., 1992; Seifert et al., 2005) and the overall quality of life (Sherman et al., 2005; Varni et al., 2004; Stigsdotter et al., 2003).

Nevertheless, the interpretation, quantification, and generalization of the research findings are often difficult for methodological limitations, lack in the study description and detailing, large heterogeneity in outcome measures used. Remains an open question: how to measure the benefits of healing gardens?

2. Methods

The study was conducted at the Famagosta Nursing Home, sited in Milano (Italy), with 290 beds (included one Alzheimer unit with 20 beds) and a "day care center" for 30 people. The staff is composed of 246 people and 30 volunteers. Famagosta NH has a garden 12.500 sq.m wide (excluded parking and pertinences), with a ratio of 40 sq.m/patient.

Today nursing homes for older persons only accommodate the most fragile persons and very few of them can enjoy the outdoor environment on their own (they are dependent on the caregivers and next of kin to go outdoors). The use of the outdoor environment depends also on its capacity to be restorative and to provide users with desirable experiences: "being away, extent, fascination and compatibility" (Kaplan & Kaplan 1989; Kaplan et al., 1998); "sense of control, privacy, social support, physical movement, access to nature, positive distractions" (Ulrich, 1999 and 2001).

Patient-specific gardens can provide general benefits related to the restorative effects of nature and respond to the specific needs of a particular

patient population. The goal of this study was to better understand the factors that influence the use of the outdoor environment at nursing homes for older persons. We decided to pursue this goal involving users in the design process, by asking staff, residents and kin about their use and experience of the outdoors at the RSA Famagosta. The study focused on factors with implications for the design process of the outdoor environment. A participatory design process was organized through the use of focus groups, a form of qualitative research in which a group of people are asked about a topic. We used "focus group" technique both with staff and residents.

Focus groups are "carefully planned series of discussions designed to obtain perceptions on a defined area of interest in a permissive, nonthreatening environment" (Krueger & Casey, 2000). Focus group is "a technique involving the use of in-depth group interviews in which participants are selected because they are a purposive, although not necessarily representative, sampling of a specific population" (Thomas et al., 1995). Focus groups, as a means of qualitative data collection, are becoming increasingly popular in health research for exploring what individuals believe or feel as well as why they behave in the way they do (Rabiee, 2004; Curtis et al., 2007; Mansell et al., 2004; Webb et al., 2001).

Two focus groups, involving a total of 20 people were convened in March 2012. The first group was limited to the staff and was made up of 9 adults (7 female and 2 male) 30-55 years of age, recruited according to the following criteria:

- recommended by the direction,
- working closely with the residents,
- willing to be involved in the study.

The second group was limited to the residents and was made up of 11 adults (7 female and 4 male) 75-85 years of age, recruited according to the following criteria:

- recommended by the direction,
- able to use the garden,
- able to participate to the study.

The staff's view is of particular importance and has a double value:

1. they have a comprehensive knowledge of the patients' wishes, needs and capabilities in the outdoor environment; they usually take patients outside;
2. they use the outdoor spaces for themselves too (eating, relax, smoking, etc.).

The residents' view is of particular importance but is very difficult to know:

1. what they say does not always coincide with the reality (lack of memory, perceptual disturbances, etc.);
2. what they say should rather help to understand what they feel.

For residents, "field observation" is very useful to collect qualitative data. We used both methods.

A structured focus group protocol, with the following characteristics, was used in each of the groups:

- 1 moderator guided the discussion in the group,
- 1 assistant-moderator took notes and asked follow-up questions,
- the focus group interviews were conducted using open-ended questions,
- the focus groups lasted 60-90 minutes and all of them were recorded,
- during the focus groups, a map of the area (building + outdoor) was showed to the group to further support the discussion.

Each of the focus group interviews was conducted according to the procedure described below. Informed consent procedures were adopted to assure the protection of human subjects. Participants were also given the opportunity to ask and have answered any questions concerning the study. After hearing a brief presentation of the moderator on the study and its purposes, participants were asked to provide some general information about themselves: age and civil status; professional qualification, professional role in the NH, specific activities carried out with residents, for the staff; previous job and time elapsed from the entrance in the NH for the residents. The moderator explicitly explained to participants that:

- there were no right or wrong answers,
- all comments were welcome,
- each participant can speak and the answers to the questions were completely voluntary,
- they were free to leave the group at any time,
- their comments would be kept confidential.

After this first phase of introduction and knowledge of the groups, the participants were asked to speak on:

1. the "garden today": who use the garden and to do what, when the garden is used, which parts of the garden are more used, why some residents and staff do not use the garden, are there any special place (beautiful, meaningful, unattractive) in the garden? 12 images of "places" in the garden were shown, asking for an assessment (like/dislike);
2. the "garden tomorrow": what do you like to do in the garden? What do you think the residents can/like to do (alone, with staff, with their kin)?

The analytic strategy included the use of audio recorded files, notes and memory (Kreuger & Casey, 2000).

3. Results and discussion

Qualitative content analysis (identifying, coding, and categorizing data) was used to analyze the data (Coffey et al., 1996; Morgan, 1997). The study produced two types of results. On the one hand, both the staff and the residents agreed on the localization of the garden areas that needs to be recovered and re-designed to meet their agreement (Figure 1).

On the other hand, has been very interesting to note some discrepancy between the staff vision of what the residents would like and what the residents say they would like. When asking to tell the activities they would prefer to do in the garden, in some cases the answers were very different (Table 1).

Table 1. Comparison among the staff and residents answers

Activities	Staff focus group (9)		Residents focus group (11)
	Staff	Residents	Residents
Contact with nature	9	9	11
Walking	9	9	11
Being alone	7	9	**3**
Socializing	8	9	11
Eating	7	/	/
Barbecuing		**6**	11
Reading	6	9	**6**
Dancing		9	**3**
Playng (bowling, cards, …)		9	11
Observing		9	11
Gardening /horticulture		9	11
Sunbathing	5	9	8
Picnic		9	11
Gymnastics		9	11
Taking care of cats		9	**1**
Feeding birds		9	**0**
Smoking	**1**	9	**0**

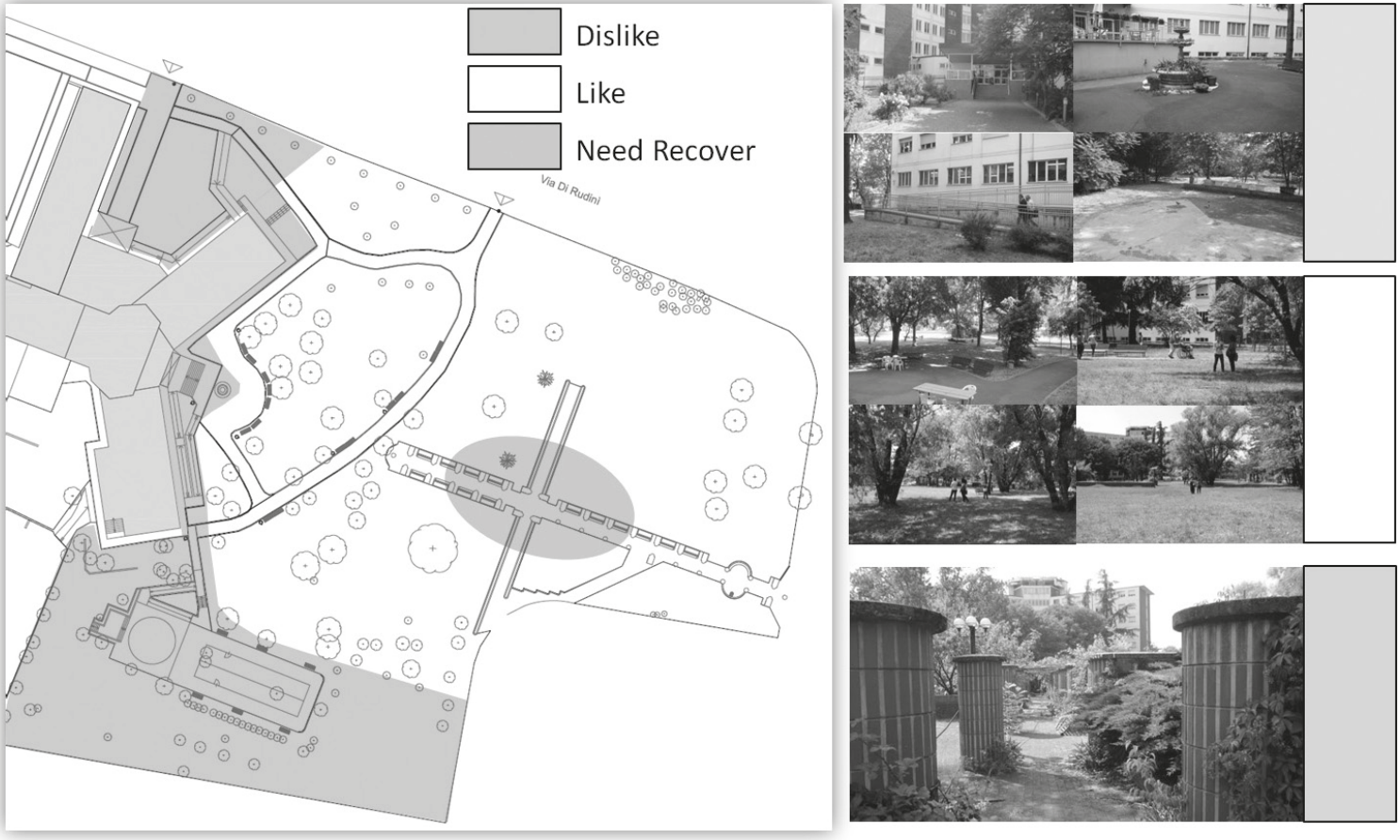

Figure 1. Localization of the garden areas that needs to be recovered and re-designed

In some cases the answer by staff is conditioned by their own whishes or by referring to few specific residents without having a more comprehensive look: for the activity "Being alone", some resident answered underlining "Why should I want to be alone? I am always alone". In this sense should be interpreted also the answer related to "Barbecuing": the activities that involve socialization are sought and desired by residents able to use the garden. In other cases the answer by staff is affected by not having sufficiently considered the physical ability and stamina ("Reading" and "Dancing"). A special case are the activities related to animals ("Taking care of cats" and "Feeding birds"): the residents speak about cats (currently present in the garden) and birds in a very "enthusiastic" way, but when they are asked "Would you like to …" they respond decisively "No". Finally, another special case is related to "Smoking": a good number of residents and staff smoke, but nobody "admit" that this activity should be planned in some way in the garden. Furthermore, the staff unanimously think that "smoking" should be an activity to be planned in the garden for the residents. It is clear the "smoking" carries a negative social value that cannot be publicly admitted. Anyway, people smoke only outdoor and this has several negative consequences on the garden (especially related with the cigarette butts).

Putting together all the information gathered from residents and staff, it is possible to delineate some specific design guidance that could allow the garden to be more used:

- the garden has already a good number of trees that should be better valorized (e.g. by adding name tags);
- there is a need to have a good balance between sun and shadow, giving people more possibilities to choose the "microclimate" they prefer (both for residents and staff);
- the garden should be designed to enhance the possibility to do rehabilitation and physical activity outdoor;
- the garden should be designed to enhance the socialization opportunities and the contact with nature;
- the garden should have the presence of water: it was pointed out that water is important for visual/sound reasons, but also for "playing with" and "walking in" (this last wish was outlined by both residents and staff);
- the garden should have areas dedicated to edible plants and horticultural activities;
- the garden should be used even in winter;
- it is necessary to improve accessibility to the garden, providing paths of different length and difficulty;
- the maintenance and cleanliness of the garden have to be improved (also in relation to cigarette butts).

Whatever the method, the analysis of the benefits of healing gardens aims to provide useful information to those who must design these spaces. The research carried out allow to identify some guiding principles:
1. contact with nature,
2. autonomy and possibility of choice,
3. safety,
4. comfort,
5. accessibility,
6. flexibility,
7. heterogeneity of spaces (types and functions),
8. familiar atmosphere.

The guidelines have been incorporated in the *Healing garden project* of the Famagosta Nursing Home sited in Milan (Figure 2).

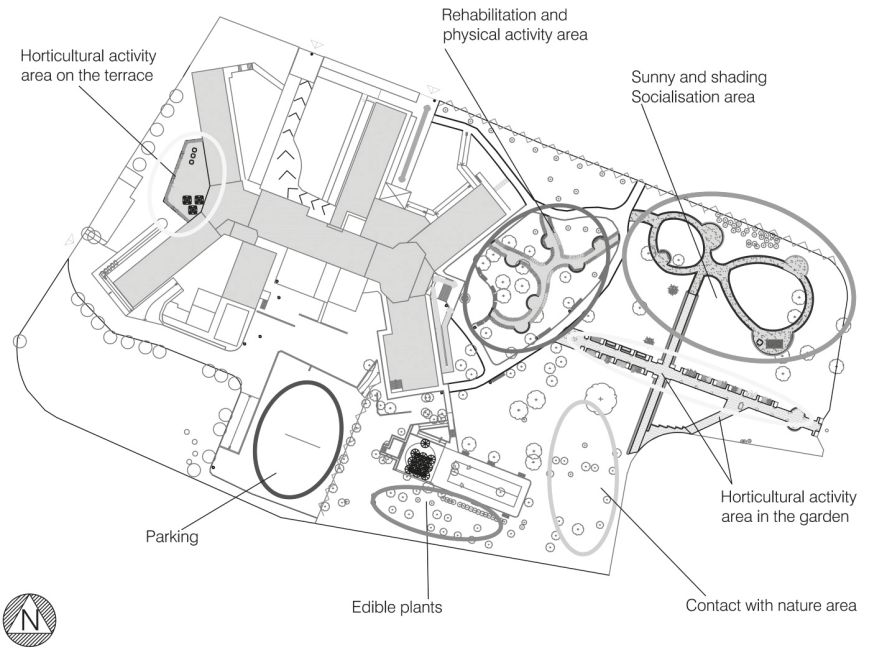

Figure 2. "Healing garden project" of the Famagosta Nursing Home (Milano, Italy)

4. Conclusion

The strategy of including residents and staff in focus groups proved to be informative (Rosen et al., 2008). We assumed that staff could well interpret the residents' wishes and needs (Bengtsson et al., 2006); the study shown that the perspectives of professionals and residents sometimes differ: this study tried to "give voice" to the residents.

The study had some limitations. First, the number of participants was relatively small. Secondly, because of the recruitment methods used, the sample of residents wasn't representative: because this research was qualitative, the data are intended to generate hypotheses. Caution should be exercised in attempting to generalize the results of this study to a broader population.

Focus group approach has proved to be useful to provide information on healing garden user needs: the findings were useful to draw design guidelines that has been incorporated into the "garden design". The next phase of the project provides for other two focus groups (with staff and residents) with the aim to discuss the proposed design.

Acknowledgements

We are grateful to Andrea Francescani and Federico Vigato, from Famagosta Nursing Home, for their full support to the research and to Nathan Perkins, from the University of Guelph, for his methodological suggestions.

References

Adevi, A.A., & Lieberg, M. (2012). Stress rehabilitation through garden therapy. A caregiver perspective. *Urban Forestry and Urban Greening*, 11, 51-58.

American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders DSM-IV-TR Fourth Edition* (text revision).

Bengtsson, A., & Carlsson, G. (2006). Outdoor environments at three nursing homes: focus group interviews with staff. *Journal of Housing for the Elderly*, 19 (3-4), 49-69.

Berkowitz, S. (1997). Analyzing qualitative data. In: Frechtling, J., & Sharp, L. (eds.), *User-friendly handbook for mixed method evaluations*. National Science Foundation.

Coffey, A., & Atkinson, P. (1996). *Making sense of qualitative data*. Thousand Oaks, CA: Sage.

Cohen-Mansfield, J., & Werner, P. (1998). The effects of an enhanced environment on nursing home residents who pace. *Gerontologist*, 38 (2), 199-208.

Cooper Marcus, C., & Barnes, M. (1999). *Healing gardens: therapeutic benefits and design recommendations*. New York: John Wiley & Sons.

Curtis, E., & Redmond, R. (2007). Focus groups in nursing research. *Nurse Researcher*, 14, 25-37.

Kaplan, R., & Kaplan, S. (1989). *The experience of nature: a psychological perspective*. Cambridge: Cambridge University Press.

Kaplan, R., Kaplan, S., & Robert, R. (1998). *With people in mind: design and management of everyday nature*. Whashington, DC: Island Press.

Kreuger, R.A., & Casey, M.A. (2000). *Focus groups: a practical guide for applied research*. Thousand Oaks, CA: Sage.

Küller, R., & Wetterberg, L. (1996). The subterranean work environment: impact on well-being and health. *Environment International*, 22, 33-52.

Mansell, I., Bennett, G., & Northway, R. (2004). The learning curve: the advantages and disadvantages in the use of focus groups as a method of data collection. *Nurse Researcher*, 11, 79-88.

Morgan, D.L. (1997). *Focus groups as qualitative research*. Thousand Oaks, CA: Sage.

Namazi, K.H., & Johnson, B.D. (1992). Pertinent autonomy for residents with dementias: modification of the physical environment to enhance independence, *American Journal of Alzheimer's Disease and Other Dementias*, 7 (1), 16-21.

Rabiee, F. (2004). Focus-group interview and data analysis. *Proceedings of the Nutrition Society*, 63, 655-660.

Ramsden, E.L. (1999). *The person as patient: psychosocial perspectives for the health care professional*. Oxford: Bailliere Tindall.

Robinson, G.C. (1939). *Patient-as-a-person: a study of the social aspects of illness*. Oxford: Oxford University Press.

Rodiek, S. (2002). Influence of an outdoor garden on mood and stress in older persons. *Journal of Therapeutic Horticulture*, 8, 13-21.

Rosen, T., Lachs, M.S., Bharucha, A., Stevens, S.M., Teresi, J.A., Nebres, F., & Pillemer, K. (2008). Resident-to-resident aggression in long-term care facilities: insights from focus groups of nursing home residents and staff. *Journal of the American Geriatrics Society*, 56 (8), 1398-1408.

Seifert, P., & Hickman, D. (2005). Enhancing patient safety in a healing environment. *Topics in Advanced Practice Nursing eJournal*, 5, 1-7.

Sherman, S.A., Varni, J.W., Ulrich, R.S., & Malcarne, V.L. (2005). Post-occupancy evaluation of healing gardens in a pediatric cancer center. *Landscape and Urban Planning*, 73 (2-3), 167-183.

Stigsdotter, U.A., & Grahn, P. (2002). What makes a garden a healing garden? *Journal of Therapeutic Horticulture*, 13, 60-69.

Stigsdotter, U.A., & Grahn, P. (2003). Experiencing a garden: a healing garden for people suffering from burnout diseases. *Journal of Therapeutic Horticulture*, 14, 39-48.

The Center for Health Design (2012). http://www.healthdesign.org (visited on 10/09/2012).

Thomas, L., MacMillan, J., McColl, E., Hale, C., & Bond, S. (1995). Comparison of focus group and individual interview methodology in examining patient satisfaction with nursing care. *Social Sciences in Health*, 1, 206-219.

Ulrich, R.S. (1984). View through a window may influence recovery from surgery. *Science*, 224, 42.

Ulrich, R.S. (1999). Effects of gardens on health outcomes: theory and research. In: Cooper-Marcus, C., & Barnes, M. (eds.), *Healing gardens: therapeutic benefits and design recommendations*. New York: John Wiley, pp. 27-86.

Ulrich, R.S. (2001). Effects of healthcare environmental design on medical outcomes. In: Dilani, A. (ed.), *Design and health. Proceedings of the Second International Conference on health and design*. Stockholm: Svensk Byggtjanst, pp. 49-59.

Ulrich, R.S. (2002). Communicating with the healthcare community about plant benefits. In: Shoemaker, C. (ed.), *Proceedings of the Sixth International People Plant Symposium*. Chicago: Chicago Botanic Garden.

Ulrich, R.S., Simons, R.F., Losito, B.D., Fiorito, E., Miles, M.A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology*, 11, 201-230.

Van Den Berg, A.E., & Custers, M.H. (2011). Gardening promotes neuroendocrine and affective restoration from stress. *Journal of Health Psychology*, 16 (1), 3-11.

Varni, J.W., Burwinkle, T.M., Dickinson, P., Sherman, S.A., Dixon, P., Ervice, J.A., Leyden, P.A., & Sadler, B.L. (2004). Evaluation of the built environment at a children's convalescent hospital: development of the pediatric quality of life inventory (TM) parent and staff satisfaction measures for pediatric health care facilities. *Journal of Developmental and Behavioral Pediatrics*, 25 (1), 10-20.

Webb, C., & Kevern, J. (2001). Focus groups as a research method: a critique of some aspects of their use in nursing research. *Journal of Advanced Nursing*, 33, 798-805.

WHO (1948). "Preamble to the Constitution of the World Health Organization" as adopted by the International Health Conference, New York, 19-22 July, 1946; signed on 22 July 1946 by the representatives of 61 States (*Official Records of the World Health Organization, no. 2, p. 100*) and entered into force on 7 April 1948.

Zeisel, J. (2006). *Inquiry by design: environment/behavior/neuroscience in architecture, interiors, landscape, and planning*. New York: W.W. Norton.

Nursing creative technology for mutual help group to people with Parkinson's disease and their families

Angela Maria Alvarez [1] **- Lucia Hisako Takase Gonçalves** [2] **Edite Lago Silva Sena** [3]

[1] *Nursing Department, Federal University of Santa Catarina, Florianópolis, Brazil*

[2] *Faculty of Nursing, Federal University of Pará, Belém, Brazil*

[3] *Health Department, State University of Southwest,Bahia, Jequie, Brazil*

alvarez0308@gmail.com

Abstract

The Multicentric study of action research approach had the objective of adapting, testing and evaluating nursing caretive technology of the mutual help group for patients with Parkinson's disease and their families, in two contexts of Brazilian country: Jequie, BA and Florianópolis, SC, by focusing on social inclusion and network relations. Fourteen patients participated in each context, who were submitted to the study of the forementioned technology. Its development had place during two semesters, in 2007. It was applied the Sluzki Modified Map of Relations of which identifies the relationships as indicative of potential social support. This application was performed in pre and post technology testing for data comparison to measure the changes. Results showed that nursing mutual help group technology contributes to maintain or enlarge the network of social support and favoring the parkinsonians social inclusion.

Keywords: Nursing; Caretive technology; Patient of Parkinson disease; Family; Mutual help groups

1. Introduction

Group actions of nursing caretive technology aim at promoting mutual help with a particular focus on chronicity among patients with Parkinson's disease (PD) and their families. Living with long-term chronic diseases amid unfavorable socioeconomic conditions constitutes one of the challenges for human aging. Studies on caretive technologies reflecting the maintenance of a possible autonomy and social inclusion of these people become crucial.

PD is a chronic degenerative, progressive, multifactorial etiology disease that affects mostly the elderly, although it can affect younger people, currently edging 300.000 patients in Brazil. The medical treatment being adopted has a clinical and surgical approach. A drug therapy at present being used aims at controlling symptoms, but on its own it is not sufficient to keep the patient in a better well-being and quality of life status. Therefore, minimum nursing, physical therapy, speech therapy and physical education care are essential as complementary resources in order to help patients preserving their functionality and allowing them to perform daily living activities and maintaining social relationships, so important to receive community support and for their well-being and self-esteem (Reis, 2004). Considering the lack of caretive technologies in social and health systems in effect to meet chronic patients, the following goals have been defined: Adapting caretive technology for mutual help group actions for the life context of patients with PD; testing and evaluating the designed technology with a focus on social inclusion and social support. Such technology was based on the theoretical groundwork for understanding the systematic professional care, designed situation for new service situations, or redesigned for services demanding adaptation and updating.

The groundwork adopted here is that of light and light-hard technologies by Merhy (2002), other than those equipment and machinery production conventional ones. It has to do with care production that exclusively expresses active work into action, as mutual help group actions with a focus on social rehabilitation and expansion of the social relations network as a potential support for patients.

In view of this, we assumed a conception of mutual help group (MHG) as a group care strategy, integrating people who share similar life situations, such as those suffering from chronic degenerative processes like Alzheimer's disease, diabetes mellitus, cardiopathies, PD, along with their family caregivers. However it is still not widespread in our environment, MHG is already an ongoing program at some health services (outpatient, primary care unit, hospital) with a significant impact on the living process of its members, because it is a space based on trust relationships that allows the free expres-

sion of feelings and sharing of experiences, information about the disease and care strategies, as well as a discussion of situations requiring decision making due to physical and psychosocial needs. In any case, it fosters a support for coping with progressive losses and constraints by an imposed experienced chronicity, favoring possible autonomy and independence, and people's empowerment, resulting in the maintenance or creation of new social ties.

In our experience, MHG, in addition to corresponding to a new identification space of social support for patients and their families, it also encourages the formation of an extended network useful to the group's demands from the perspective of the person's entirety (Alvarez, Pelzer & Sena, 2004; Silverman, 1984). As to social support, we assumed it as an emotional and instrumental support based on a protection interpersonal process featuring reciprocal exchange in a specific context, and that results in an increase in mental health. This protection resource takes place in the interpersonal giving-taking relationships dynamics, usually among people close to each other, such as family members, friends and members of the surrounding community (Ramos, 2002; Williams, Barclay & Schmied, 2004). In this sense, social support is beneficial because it prevents and promotes while coping with problems, strengthens the sense of control over one's life, maintains the autonomy and raises self-esteem, reduces anxiety and depressive states, increases survival and safety due to the most intimate emotional relationships, keeping the person more competent to adapt to tribulations of everyday life. By knowing the relationships of the person in certain circumstances, from the closest to the farthest ones that revolve around him/her, we can identify that each relationship plays an exchange of several benefits between them. These relationships tend to be spontaneous, but it is possible and even necessary in many instances that they are encouraged to the mental health of people living in the community (Sluzki, 1997).

Adapting and testing the caretive technology based on MHG contribute in designing instrumental approaches that can facilitate the social reintegration of PD patients, even those already with functional limitations. Another relevant aspect is the gerontology interdisciplinarity that the mutual help group work provides, since health professionals mediating said proposal undertake to study and understand the human experience diversity, and, in partnership with the PD individuals find viable solutions in meeting the demands arising from everyday life. We must also add the contribution of the aspect of promoting citizenship, as people in the group are cared with respect, privacy and non-discrimination due to their chronic and aging condition, and they are assured to make decisions about their own lives, besides feeling more empowered to claim their rights in public and private sectors and in society in general.

2. Methodology

2.1. Type of study

The testing and evaluation of caretive technology concerned was based on research-action approach, characterized by mutual cooperation between researchers and involved individuals, in order to enter or renew health practices (Trentini & Paim, 2004). In this particular case, there was a need to establish the practice *locus*, MHG with the participation of PD patients and their families.

2.2. Context of study

Multicentric in nature, the project was replicated in two different geographical-cultural contexts: Jequié, BA and Florianópolis, SC, respectively in the southern and northwestern regions in Brazil. At the time (2007), Jequié had an estimated population of 149.258 inhabitants, of which 15.616 were elderly, accounting for 10.5% of the total population (IBGE, 2001). The specific caring actions for the PD patients were practically non-existent in the city. This audience began integrating into a group and being given special attention from this project: *Caretive Technology for Autonomy and Social Inclusion of the Elderly Patient with PD*, when during a 2006 semester researchers of the local team strove to organize the MHG – in the form of university extension project of the Health Department at UESB (Universidade Estadual do Sudoeste da Bahia, State University of Southwest Bahia). Accordingly, the research *locus* with the meeting of potential study participants was formed. Florianópolis (capital city of the state of Santa Catarina) had an estimated population of 416.267 inhabitants, out of which 41.979 were elderly people, accounting for 10.1% of the total population (IBGE, 2001). The MHG of PD patients and their families of this municipality had been working since 2005 as a university extension campus project at UFSC (Universidade Federal de Santa Catarina, Federal University of Santa Catarina).

2.3. Methodological procedures

The implementation of the study took place in stages: design of technology adapting it to each context based on some examples adopted in our environment (Alvarez, Pelzer & Sena, 2004); implementation, evaluation and

successive rectifications of technology designed during the two 2007 semesters; pre-and post-testing evaluation of caretive technology in order to assess the effectiveness in patients with Parkinson's disease in terms of their social insertion and maintenance or expansion of the relationships network around them. The performance of each group meeting included: openness to integration and relaxation through music, body movement practices motivating participants to the next moment, in which daily experiences of coping with the disease and the chronicity process were socialized, encouraging exchanges of personal and family experiences, which would configure as help and support for people. The meetings were always concluded with a summary of the content of the discussion, coordinated by one or more professionals, who acted as facilitators for the MHG development. The fortnightly meetings caused their participants to communicate with each other, to socialize feelings and needs and to create emotional and mutual help bonds. The strengthening of ties was stimulated by both telephone contacts among peers, as well as participation in other caretive technology groups such as bodily experience, musical practice and physical-vocal rehabilitation.

2.4. Caretive technology evaluation – data collection tool

The implementation of the study, specifically, the caretive technology testing adapted in MHG, took place after preparations made in 2006, for its installation and effective operation, as an university extension program and research *locus*. In order to evaluate the effectiveness of designed technology, Relationships Map of Sluzki Modified – MMRS (1997) that identifies the relationships network was adopted. This application took place in the pre- and post-testing period performed during the two 2007 semesters, considering the need for comparative measures to assess possible changes in parameters as a result of the tested technology. The MMRS includes four categories: Family, Friends, community Relationships and relationships with social and health services, in which we can identify the density or size of relationships and the level of closeness of each relationship as more intimate, intermediate and distant. The application of the tool by asking with patients: "Who are the people of the relationship or of coexistence and care, and what is the kind of closeness?". Responses were pointed up on the map according to the categories and lines of closeness.

2.5. Ethical concerns with the study participants

The project was operated in accordance with the provisions of Resolution no. 196/96 of the National Health Council of the Ministry of Health (Brazil), which sets forth the rules and guidelines governing researches with human beings. It was duly approved by the Ethics Committee on Human Research at UFSC and filed under no. 350/2005.

3. Results and discussion

3.1. Sample characterization

The sample comprised a case series of 28 PD patients in both contexts. At Jequié campus, there were 9 men and 5 women; and at Florianópolis campus there were 10 men and 4 women, confirming the clinical practice and reported in literature: PD affects more men than women (Reis, 2004). The average age of participating patients was 67 years. Summing up the two contexts, we found 06 patients whose onset of illness occurred at the age between 48 and 59 years, confirming the literature of incidence of 1 to 2% at an early age, before the old age is reached (Reis, 2004). Concerning the time of DP identification, the majority reported living with the disease already from 06 to over 10 years. The great majority of participants lived in the company of their spouses, and when widowed or separated, usually with their daughters and other relatives such as grandchildren and sisters. Many of these family members were those who accompanied the patient to attend the MHG meetings and represented their actual social support. As to occupation, Jequié participants said they were no longer on active duty, except for two traders. They were: radio man, lathe operator, mason, craftsman, and watchmaker, and for women, housewives. Within Florianópolis context, most were retirees, they were: Mechanical engineer, road engineer, computer engineer, university professor, dentist, public servant. For women, they were painter, waitress, seamstress, and also housewives. These higher education level professionals who held power in the performance of work, even inactive and MHG participants possibly availed themselves of the condition of empowerment still maintained to engage their peers and commit themselves to the point of successfully create the Parkinson Association – SC, especially aiming at collective struggles of specific rights with public authorities and society in general.

3.2. Nursing caretive technology in actions of mutual help and social inclusion

Taking into consideration the aim of evaluating the assumption that caretive technology, MHG would stimulate the formation or expansion of the social support network of Parkinson patients we tried to verify this relationship through the MMRS applied in the pre-and post-testing of the technology, identifying changes in the extent and degree of closeness of the categories of people involved in the relationships network.

As for the total number of people in relationship in the MMRI, within both contexts, we verified a considerable change: from 07 to 48 people involved with the PD patients in Jequié, and from 06 to 16 people in Florianópolis. Said increase change of the relationships network gravitating around the patient represent people linked for some reason, and they can be educated and trained to become real support resources. Whereas the absence or the small number of people involved requires an active search for possible relationships in the family and community, as well as special attention on mobilizing closer and more frequent relationships of the staff members with social and health services, as a care formal network available to users.

Regarding the distribution of categories of relationship people, it was found that the family is the one that receives the heaviest burden, becoming the largest support resource. Studies on social support network have indicated that patients with chronic diseases tend over time to reduce their social and emotional bonds (Reis, 2004; Gonçalves, Alvarez & Alvarez, 2007), however, our result contradicts the finding, presumably as a positive effect of the actions undertaken in the MHG. Throughout the MHG implementation, it was observed that maintaining or increasing the relationships network may be attributed to the interest and involvement of the people around the patient, because of the opportunity to acquire knowledge about the disease and treatment modalities; peer learning about coping mechanisms of the limitations imposed by the disease, such as mutual aid to exchange experiences of those who experience them; taste for feeling helpful and helping others; recognition and appreciation of the potentialities of DP patients; opportunities of space for expression of emotions; facilitating access to social and health services; motivation for social interaction and the exercise of citizenship as individuals having rights, among others. The social relationship network structure can be classified into formal and informal. The latter ones often comprise health professionals who serve them. Whereas informal relationships consist of family, friends, neighbors, church members, people participating in social and support groups. Although both relationships are complementary, in a scenario of fragility and inefficiency of the State in deal-

ing with social and health issues, informal relationships stand out, especially the family in supporting and caring with patients, as it could be seen in the results. The type of support given by the family (instrumental, emotional, informational and positive interaction), prevailed the instrumental or direct care one. Such support has been reported in several studies involving family caregivers of the elderly (Danielson, 1993; Ramos, 2002; Domingues, 2006), with the aggravating circumstance of, as the fragile situation of the patient progresses, increases the complexity of the care process, and the number of family members as caregivers tends to decrease to the extent of being limited to one or two caregivers.

Nevertheless, this study brings new data that contradicts this finding, presumably because the patients participating in the MHG are accompanied by their family caregivers who in the meetings are encouraged to aggregate the largest possible number of family members on a rotating basis in the caretive activities aimed at reducing caregiver burden and divide the main tasks for a family caring healthy dynamic. By categories frequency order of relationship people within the network, even in different intensity, appear friends, neighbors, professionals in the health system and people in the community, including the very MHG mates from other social groups. Such configuration suggests that technology, MHG favors the establishment of new relationships and maintaining existing ones, validating its role of promoting positive social interaction and education for a healthier living. It was evident that the geographical proximity of neighbors included in the case as friends, fosters cooperation relationships and several supports, including instrumental activities, corroborating the findings of other researches (Sena, Meira, Souza, Coronago, Gonçalves & Santos, 2008; Dias, Nascimento, Mendes & Rocha, 2007). As to the formal relationship from the Health System, the physiotherapist stood out as the professional with the closest relationship, followed by doctors, nurses, physical education practitioners and health workers among others. Therapeutic requirements for rehabilitation specific care for every Parkinson patients lead them to seek compulsory interactions that provide them with suitable therapeutic care. Such interactions turn out to be considered and indicated in close or intermediary proximity, by the very patient as being meaningful social relationships, and therefore of actual social support. Among community relationship people mainly mentioned by patients are especially members of social groups for the third age, church members, and MHG itself. In view of that, group caretive actions helped to develop self-confidence, mobilizing them to maintain or expand their insertion, actively participating and becoming each of them a reciprocal social support, by sharing personal experiences and help exchanges, as well as building emotional and friendship bonds.

4. Practice and scientific relevance

The adopted approach of research-action type (Trentini & Paim, 2004), lasting relation among researchers, parkinsonian patients and their families, in the process of adaptation and testing of such nursing caretive technology, has contributed to this study success, and certainly, it is an appropriate method for researches looking for beneficial interventions to the people with prolonged chronicity.

References

Alvarez, A.M., Pelzer, M.T., & Sena, E.S. (2004). O valor dos grupos de ajuda mútua para familiares cuidadores de idosos portadores de doença de Alzheimer e outras similares. *Rev Ciências da Saúde*, 23 (1-2), 94-98.

Andrade, G.R.B., & Vaitsman, J. (2002). Apoio social e redes: conectando solidariedade e saúde. *Ciênc Saúde Colet*, 7 (4), 925-934.

Danielson, C.B. (1993). Families health and illness. In: Danielson, C.B. (ed.), *Social support and mutual support groups*. St Louis: Mosby, pp. 213-229.

Dias, J., Nascimento, L.C., Mendes, I.J.M., & Rocha, S.M. (2007). Promoção de saúde das famílias de docentes de enfermagem: apoio, rede social e papéis na família. *Texto e Contexto Enferm*, 16 (4), 688-695.

Domingues, M.A.R.C. (2006). *Mapa mínimo de relações: validação da adaptação do instrumento básico para configuração da rede de suporte social do idoso*. Tese. São Paulo (SP): Universidade de São Paulo, Faculdade de Saúde Pública.

Gonçalves, L.H.T., Alvarez, A.M., & Arruda, M.C. (2007). Pacientes portadores de doença de Parkinson: significado de suas vivências. *Acta Paul Enferm*, 20 (1), 62-68.

IBGE – Instituto Brasileiro de Geografia e Estatística (2001). *Dados populacionais de 2000*. Brasilia (DF): IBGE. Disponível em: http://www.ibge.gov.br/cidadesat/default.php (acesso 02/2010).

Ramos, M.P. (2002). Social support and health among elderly. *Sociologias*, 7 (4), 156-175.

Sena, E.L.S., Meira, E.C., Souza, A., Coronago, V.G.M., Gonçalves, L.H.T., Santos, E., et al. (2008). Assistive technology of musical experiences in the recovery of vocal elderly patients with Parkinson's disease. *Rev. Bras. Geriatr. Gerontol.*, 11 (3), 341-355.

Silvermam, P.R. (1984). *Mutual helps groups organization and development.* Bervely Hills: Sage.

Sluzki, C.E. (1997). *The social network in systemic practice: therapeutic alternatives*. São Paulo (SP): House Psychologist.

Trentini, M., & Paim, L. (2004). *Search convergent-care: a design that unites doing and thinking in health-care practice in nursing*, vol. 2. Florianópolis (SC): Insular.

Williams, P., Barclay, L., & Schmied, V. (2004). Defining social support in context: a necessary step in improving research, intervention and practice. *Qualitative Health Research*, 14 (7), 942-960.

Thanks to dr.ssa Ylenia Canavesio and Verdiana Trapletti
for the important editing contribution to the Issue.

Neuropsychological Trends

Submission Procedure

Neuropsychological Trends (abbr. *Neuropsychol. trends*) is an electronic journal. Submissions are solicited twice a year (January and July). Notifications of acceptance will be published on the journal website approximately 3 months after each deadline, and all accepted papers will remain permanently published on the website.

All papers have to be submitted by e-mail to: neuropsychologicaltrends@psychoneuronet.com

The following items have to be attached as separate files:
- text file (included title page and abstract),
- tables (if any),
- figures (if any).

Papers shall be submitted in their final version.

Accepted paper formats include simple text, Microsoft Word, Rich Text Format (RTF). The name and affiliation of the author(s) and an electronic (e-mail) return address have to be indicated in all submissions.

Post-acceptance

PDF page proofs are sent to authors via e-mail only for the final check. No substantial modifications are allowed at this step.

With the submission to *Neuropsychological Trends* the authors acknowledge that reproduction of their paper will be allowed in case their paper is published.

Copyright