Assessment and training of the pragmatic competence: Recovery and strengthening of communicative abilities through the Cognitive Pragmatic Treatment.

Data from neurological and psychiatric population

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Social life is based on the ability to communicate and interact with other people.

Despite the different aetiologies and specific clinical features, the communicative competence can be compromised as a result of neuropsychological disorders, such as TBI (McDonald et al., 1999; Davis & Coelho, 2004; Angeleri et al., 2008; Marini et al., 2001; Carlomagno et al., 2011), or psychiatric disorders, as schizophrenia (Colle et al., 2013; Mailijison et al., 2004; Champagne-Levau, 2006; Marini et al., 2008).

Deficits related to the social use of communication, even if the linguistic competence is not impaired (McDonald, 1992; Marini et al., 2008; Cummings, 2007)

**FOCUS OF THE THERAPEUTIC PRACTICE:**
**EFFECTIVE USE OF LANGUAGE IN A PARTICULAR CONTEXT**

(Carlomagno et al., 2000)
Introduction (2)

Several assessment tools,
Different procedures
different components of the pragmatic competence

Communicative Abilities of Daily Living
(CADL; Holland, 1980)

Profile of Communicative Appropriateness
(PCA; Penn, 1985)

Pragmatic Protocol
(PP; Prutting & Kirchner, 1987)

Lille Communication Test
(LCT; Rousseaux et al., 2001)

Awareness of Social Inference test
(TASIT; McDonald, Flanagan, Rollins & Kinch, 2003)

Profile of Pragmatic Impairment in Communication
(PPIC; Linscott et al., 1996)

Montréal Evaluation de la Communication (MEC; Joanette et al., 2004)

Protocollo per la valutazione delle abilità comunicative (MAC; Tavano et al., 2013)

Difficult to make comparison and derive conclusions.
The Assessment Battery for Communication (ABaCo) (Bosco et al., 2012; Sacco, Angeleri, Colle, Gabbatore, Bara, Bosco, 2013; Angeleri et al., 2011) investigates the communicative-pragmatic abilities, both in comprehension and production, taking into consideration a wide range of pragmatic phenomena.

**EVALUATION SCALES:**

1. **LINGUISTIC SCALE** & **EXTRALINGUISTIC SCALE**
   - BASIC SPEECH ACTS
   - DIRECT AND INDIRECT SPEECH ACTS
   - DECEIT AND IRONY

2. **PARALINGUISTIC SCALE**
   - BASIC SPEECH ACTS, COMMUNICATIVE ACTS EXPRESSING AN EMOTION
   - PARALINGUISTIC CONTRADICTION

3. **CONTEXT SCALE**
   - DISCOURSE NORMS (GRICE'S MAXIMS)
   - SOCIAL NORMS

**Traumatic Brain Injury:** Angeleri et al., (2008). *Brain & Language*

**Schizophrenia:** Colle et al., (2013). *Journal of Communication Disorders.*

**Aphasia:** Gabbatore et al., (2014). *Minerva Psychiatrica.*

**RHD:** Parola, Gabbatore et al., (Accepted for Publication). *J of Neurolinguistics*

**Children:** Bosco et al., (2013). *Journal of Child Language.*
Introduction (4)

Assessment Battery for Communication

Equivalent Forms of the Assessment Battery for Communication
(Bosco et al., 2012)

- Same kind of items:
  same level of complexity and same structure, different content

- Test and re-test procedures, without learning effect

Italian Norms of the Battery
(Angeleri, Bosco, Gabbatore, Bara & Sacco, 2012),
against which we could compare patients’ performance
After Traumatic Brain Injury (TBI), patients do not necessarily show specific linguistic deficits, but they may exhibit difficulties in the use of appropriate social communication (Dahlberg et al., 2004)

After TBI, pragmatic deficits are often detectable in:

- Respecting linguistic, extralinguistic and paralinguistic rules and conventions (Angeleri et al., 2008; Adenzato et al., 2002)

- Monitoring and adapting the communicative content to the conceptual and emotional context of the communicative interaction (McDonald, 2000; Croker & McDonald, 2005)

- Understanding sarcasm, humor (Docking et al., 2000) and in formulating requests (McDonald & vonSommers, 1993)

- Starting and maintaining a conversation (Coelho et al., 2002) and in the narrative abilities (Marini et al., 2011)
Lack of an unique, integrated rehabilitative treatment focused on the entire communicative-pragmatic ability and able to take into consideration also cognitive components such as ToM and executive functions, which have a role in the pragmatic competence (Martin & McDonald, 2003).
Rehabilitative training for TBI individuals

AIMS AND HYPOTHESIS

Creation of a rehabilitative program for the communicative abilities, the Cognitive Pragmatic Treatment, able to face in an integrate manner the entire communicative-pragmatic competence

- Sessions dedicated to all the aspects of communication: linguistic, extra-linguistic paralinguistic, social appropriateness social and conversational abilities

- Rehabilitation of aspects such as awareness, planning and Theory of Mind, which are important for the self-monitoring and for structuring effective communicative interactions

- Ecological setting, with direct feedback and self-monitoring through the video recording of each session
Design, methods and material

24 sessions
90 minutes each
2 sessions a week

- Awareness
- Global communicative abilities
- Linguistic abilities
- Extralinguistic abilities
- Paralinguistic abilities
- Social appropriateness
- Conversational abilities
- Conversational abilities at the phone
- Narrative abilities
- Theory of Mind
- Planning abilities

T₀: baseline
T₁: Pre-training
T₂: Post-training
T₃: Follow-up

ABaCo form A
ABaCo form B
ABaCo form A
ABaCo form B
Cognitive Pragmatic Treatment: Structure

Stage 1: Introduction to the theme of the session and summary of the previous sessions

Stage 2: Video presentation and discussion of what observed

Example: Marcello is in the kitchen making a coffee. He accidentally tips the sugar bowl over and spills the sugar on the table. Marcello quickly puts the sugar bowl away and drinks his coffee. Marta comes in, ready to go out, and puts her bag on the table to look for her keys. When she picks the bag up again, she realizes it's all sticky. So, she says "Marcello, where did this sugar come from?". Marcello says: "I don't know. I usually have my coffee without sugar."

Stage 3: Role playing and specific exercises

Example:

**Tomorrow is gonna rain**
- MAD (you had planned to go to the beach)
- HAPPY (you can skip that appointment you hated to go to)
- UNCOMPLAINING (it has been raining uninterrupted for days)

Stage 4: Conclusion and homework
Rehabilitative training for TBI individuals

PARTICIPANTS

N = 15 TBI patients

• Age: $M = 36.7; \ DS = 8.73$ (range: 22-51 years)

• Education: $M = 9.27; \ DS = 2.6$ (range: 8-16 years)

• Sex: 10 males; 5 females

• Italian native speakers

• Chronic patients (range: 12-228 months post TBI; $M = 76.13; \ DS = 60.76$)

• Glasgow Coma Scale: score ranging from 3 to 8

• Mini Mental State Examination (MMSE; Folstein et al., 1975; cut off 24/30) Token Test (De Renzi e Vignolo, 1962; cut off 29/36.)

RESULTS (1) Control activities or spontaneous recovery

Paired samples T-test between scores obtained at ABaCo at T0 and T1.

The analysis shows that the performance of the patients do not improve during the No-Treatment period, neither spontaneously nor as result of unspecific-control activities, both in comprehension (T test: t = .88, p = .41) and production (t = .56, p = .59).
RESULTS (2) Training Effectiveness

Paired samples T-test between scores obtained at ABaCo at T1 and T2.

The analysis reveals that the performance of the patients post-training are significantly better than the pre-training ones, both in comprehension (T Test: $t = 4.9; p < .001$) and in production ($t = 5.07; p < .001$).
The results remained constant even after three months, as evidenced by the comparison between scores obtained at T1 (pre training) and Follow Up assessment both in comprehension ($t = 4.95; p < .001$) and production performance ($t = 2.93; p = .03$).
In particular, the improvements are statistically significant in all the scales of the Equivalent forms of ABaCo: linguistic ($t = 3.29; p = .005$), extralinguistic ($t = 3.06; p = .008$), paralinguistic ($t = 2.66; p = .02$) and context scale ($t = 2.86; p = .01$).
Middle and Superior Temporal Gyrus (BA 22)

- Figurative aspects of communication, i.e. metaphor and irony (Wang, Lee, Sigman, & Dapretto, 2006; Bambini et al., 2011).
- Comprehension of ironic statement (Eviatar & Just, 2006)
- Emotional prosody (Mitchell, Elliott, Barry, Cruttenden, and Woodruff, 2003)

Precentral Gyrus (BA 4, 6)

- Prosodic production (Glosser et al., 2008)
- Comprehension of metaphoric statement (Mashal et al., 2007).

Cingulate Gyrus (BA 24)

- Emotional processing (Kuchinche et al., 2005)
- Facial expression recognition (Batty & Taylor, 2003)
- Conflict-monitoring and outcome-evaluation (Torta & Cauda, 2011)
The training is effective in improving the communicative abilities of patients with TBI, with stable improvements even after three months from the end of the training.

- The patients exhibit an improvement in understanding and producing different kinds of communicative acts, both through the linguistic and extralinguistic modality; patients show also a greater fluidity and confidence in using facial expressions, the tone of the voice and the gaze to communicate their emotions, as shown by the improvement at the paralinguistic scale of ABaCo; moreover, they also show a better use of the contextual cues and a better comprehension of the social appropriateness rules.

- The improvements are consistent over time, as shown by the scores obtained at Follow Up.

- The results obtained comparing pre and post treatment highlight that in stable TBI patients, it’s possible to detect changes in functional connectivity following a specific rehabilitative treatment, in areas related to the pragmatic competence.
Communicative dysfunction is a common and invalidating impairment in schizophrenia:

Difficulties in understanding indirect speech acts (Corcoran, 2003), deceits, ironies, metaphoric and idiomatic expressions (Langdon et al., 2002; Tavano et al., 2008), in recognizing failures of the communication (Bosco et al., 2012).

Impaired performance in respecting the Grice’s Maxims (Tény et al., 2002) and in adapting the communicative content to a particular context during communicative interaction (Colle et al., 2013).

Difficulties in organizing the discourse (Marini et al., 2008; McPherson & Harvey, 1996) and in comprehending and producing emotional tones of the communicative interchanges (Edwards et al., 2002).
Study 2
Rehabilitative training for schizophrenic individuals

COGNITIVE FUNCTIONING (e.g. Wykes et al., 2001; 2003; Hogarty et al., 2004)

SOCIAL FUNCTIONING (e.g. Penn et al., 2007)

METACOGNITION (e.g. Roncone et al., 2004; Kayser et al., 2006)

No specific treatments for the communicative - pragmatic ability
AIMS AND HYPOTHESIS

To test the effectiveness of the **Cognitive Pragmatic Treatment** on a sample of schizophrenic patients, in enhancing their communicative pragmatic abilities.

Improvement of the performance of the patients in all the aspects examined during the training is expected.

Improvement consistent over time.

Investigation of possible variation of functional brain connectivity of the patients at the resting state after training, using a Resting State fMRI paradigm.
Rehabilitative training for TBI individuals

PARTICIPANTS

N = 17 schizophrenic patients (DSM-IV)

• Disease onset: $M = 15.27; DS = 8.61$ (range: 2-30 years)

• Age: $M = 41.65; DS = 7.84$ (range: 29-61 years)

• Education: $M = 11.18; DS = 3.24$ (range: 8-18 years)

• Sex: 10 males; 7 females

• Italian native speakers

• PANSS: negative symptoms $M = 13.70; DS = 7.18$; positive symptoms $M = 17; DS = 8.94$; general symptoms: $M = 42.5; DS = 15.26$

• Mini Mental State Examination (MMSE; Folstein et al., 1975; cut off > 24/30)
24 sessions
90 minutes each
2 sessions a week

• Awareness
• Global communicative abilities
• Linguistic abilities
• Extralinguistic abilities
• Paralinguistic abilities
• Social appropriateness
• Conversational abilities
• Conversational abilities at the phone
• Narrative abilities
• Theory of Mind
• Planning abilities

T0: Pre-training
T1: Post-training
T2: Follow-up

ABaCo form A
ABaCo form B
ABaCo form A
RESULTS (1) Control activities or spontaneous recovery

Paired samples T-test between scores obtained at ABaCo at T1 and T2; the analysis reveals that the performance of the patients post-training are significantly better than the pre-training ones, both in comprehension (T Test: $t = 5.239; p < .001$) and in production ($t = 4.040; p = .001$).
The results remained consistent over time, even after three months, as evidenced by the comparison between scores obtained at T1 (pre training) and Follow Up, both in comprehension ($t = 4.039; p = .001$) and production ($t = 4.040; p = .001$).
In particular, the improvements are statistically significant at linguistic ($t = 3.817; p = .002$), extralinguistic ($t = 5.138; p < .001$) and paralinguistic scale ($t = 3.152; p = .006$); the improvements on the Context Scale, were at the limit of the statistical significance ($t = 2.063; p = .056$).
RESULTS (4) Behavioral data:
Single case R. M.
RESULTS (5) Single case.
FUNCTIONAL CONNECTIVITY
Resting State: ALFF index

Results of post- minus pre- treatment, subject R.M.

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**Bilateral Superior and Middle Temporal Gyrus** (BA 22)
- Figurative aspects of language, especially metaphors (Kircher, Leube et al. 2007).
- Elaboration violation of semantic restriction (Kuperberg et al. 2000)
- Linguistic and emotional aspects of speech intonation (Wildgruber, Hertrich et al., 2004)

**Bilateral Superior Frontal Gyrus** (BA 11)
- Semantic-inferencing processes and executive functions’ control (Rapp et al., 2004)
- Processing of ironic statement (Wang et al., 2006)
- Discourse organization (Robertson et al., 2000), coherence and sentences connection (Ferstl and von Cramon, 2002).
- Evaluation of the external context and mentalization processes (Raichle, MacLeod et al. 2001).

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_Further references: Gabbatore, Bosco et al. (Under Review) Journal of Neurolinguistics._
The **Cognitive Pragmatic Treatment** is effective in improving the communicative abilities also in schizophrenic patients, with stable improvements even after three months from the end of the training.

- The patients exhibit an improvement in understanding and producing different kind of communicative acts, both trough the **linguistic** and **extralinguistic** modality;

- They also show a better use of the contextual cues and a better comprehension of the social appropriateness rules, as shown by the improvement at the **context** Scale of ABaCo;

- Intensification of the spontaneous activity of the brain computed through the ALFF index, was observed in areas related to the pragmatic components trained along the treatment.
This explorative pilot study, seems to show the efficacy of the Cognitive Pragmatic Treatment in improving the communicative-pragmatic abilities in chronic patients with TBI and schizophrenia.

• The study confirms previous studies showing that chronic TBI patients (Dalhberg et al., 2004; Braden, 2010) and stabilized individual with schizophrenia (Krabbendam & Alemane, 2002) are able to benefit from specific treatments.

• First study with the equivalent forms of the same tool used in different assessment phases.

• First study specifically focused on the improvement of the communicative-pragmatic abilities and not on generalized improvement of social functioning.

• In line with studies in several domain (see Habel et al., 2010; Caglio et al., 2012; Laatsch et al, 2004; 2006) the study suggests fMRI to be a promising tool to investigate the effectiveness of the training in terms of modification of functional brain connectivity. This is the first study where the behavioural data are accompanied by investigation on the variations in terms of functional brain connectivity after a training focused on the communicative-pragmatic abilities. Results in line with a metanalysis (Rapp et al., 2012) on fMRI studies focused on non literal language.
Limitation and future perspectives

- Recruitment of control groups
- Increasing the number of participants in both the samples
- Group study with the schizophrenic sample to investigate the changes in the post-treatment functional brain connectivity, and confirm the present results.
Development of pragmatic abilities (1)

125 normally developing Italian children

4 - 4;11 (N=25)
5 - 5;11 (N=25)
6 - 6;11 (N=25)
7 - 7;11 (N=25)
8 - 8;11 (N=25)

• Developmental stages in pragmatic abilities

• Interrelation with cognitive abilities and theory of mind

• Investigation on intercultural variability, through the comparison of the results obtained by the Italian and the Finnish children.
Development of pragmatic abilities (2)

PRAGMATIC ABILITIES

PRAGMA test (Loukusa et al., 2009)

NARRATIVE ABILITIES

ENNIE test (Schneider et al., 2005)
CAT STORY test (Mäkinen et al., 2014)

COGNITIVE AND
THEORY OF MIND ABILITIES
Subtests from NEPSY
(Korkman et al., 2007; Giunti OS, 2011)
Development of pragmatic abilities (3)

170 typically developing monolingual Finnish children (83 boys and 87 girls).
4- to 8-years-old
KIITOS!

GRAZIE!

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