

Social skills and neurocognitive individualized training in schizophrenia: comparison with structured leisure activities

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Abstract Cognitive impairment and deficits in social skills have been largely documented in patients with schizophrenia and are increasingly recognized as rate-limiting factors for recovery. Evidence has been provided that cognitive training and social skills training (SST) are effective to treat cognitive and social skills impairment in schizophrenia; however, the translation of improved performance on cognitive or social skills tasks into improved functional outcome is controversial. According to recent reviews, interventions providing cognitive training in conjunction with psychosocial rehabilitation have a greater impact on functional outcome than either intervention

alone suggesting that the two treatment approaches may work together in a synergistic fashion. The present pilot study was designed to test the hypothesis that an integrated rehabilitation program, including individualized cognitive and SST, is more effective than the structured leisure activities (SLA) carried out in many Italian Mental Health Departments. The primary outcome measure was subjects' personal and social functioning as assessed by the Interview for the assessment of disability. The study is based on a controlled design including randomization to treatment groups, blind assessments and stable pharmacological treatment. Subjects were recruited among patients attending three psychiatric facilities located in the Italian region Campania. Thirty patients were randomized to the experimental program "social skills and neurocognitive individualized training" (SSANIT), and 30 to SLA. The two programs were matched for the overall duration as well as frequency and duration of the sessions. The two groups of patients did not differ at baseline on psychopathology, neurocognitive and personal/social functioning. After 6 months of treatment, personal and social functioning was significantly better in patients assigned to SSANIT than in those assigned to usual rehabilitation activities practiced in Mental Health Departments. No advantage was observed for either program on psychopathological and cognitive outcome indices. As for other integrated programs, also for SSANIT further studies are needed to verify generalization and persistence of the observed gains, and to clarify most adequate length and doses of the therapeutic intervention as well as the relative contribution of each program component to its impact on subjects' disability.

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Introduction

Impairment in several domains of cognition has been documented in patients with schizophrenia [19, 20, 23, 25, 32, 37, 64]. It has been related to poor functional outcome [8, 22–25, 35, 37, 64] and quality of life [28, 69], as well as to difficulties in benefiting from rehabilitation programs [34, 63]. Evidence has been provided that it is equally or more important in predicting functional outcome as positive or negative symptoms [14, 29, 48, 67, 68, 71].

Impairment in social skills (i.e. the ability to use own repertoire of verbal/non-verbal abilities, as well as of social cognition and competence) has also been found in patients with schizophrenia and considered as a further rate-limiting factor to recovery [6, 60].

Typical antipsychotics are relatively ineffective on cognitive deficits [36] and when used at high doses may even worsen them [12]. Atypical antipsychotics seem to produce a moderate improvement [58, 72]; however, neurocognitive impairment persists even after long term treatment with these drugs [30]. Non-pharmacological interventions targeting cognitive deficits in schizophrenia are generally referred to as either “Cognitive Remediation” or “Cognitive Training”. The second denomination is preferred by those who consider the term remediation as misleading when used for deficits which are most probably neurodevelopmental. Interventions based on cognitive training were the object of several meta-analyses, showing effect sizes from large [40] to moderate [39, 49, 65]. However, it is not clear whether improvement on training tasks translates into better functional outcome and why some patients fail to benefit from this type of intervention.

Few studies investigated the impact of antipsychotic drugs on social abilities and reported negative findings [4, 6, 66]. The efficacy of social skills training (SST), a behavioral intervention that focuses on social abilities, is well established in patients with schizophrenia [11, 21, 38, 41, 43, 60]. The training is based on role-play sessions and homework assignments. No consensus has been reached on generalization and durability of its effects into patients’ everyday life [43, 44, 56, 60].

In the last years, integrated interventions have been developed to improve both the deficits of cognitive functions and social competence [5, 15, 33, 51]. According to recent reviews, interventions providing cognitive remediation in conjunction with psychosocial rehabilitation (SST or social information processing training or vocational rehabilitation) have a greater impact on functional outcomes than either intervention alone suggesting that the two treatment approaches may work together in a synergistic fashion [49, 50].

The present pilot study was designed to test the efficacy of a new integrated rehabilitation program for patients with

chronic schizophrenia or schizoaffective disorder. In the light of evidence that programs targeting both neurocognitive functions and social skills may be more effective than either intervention alone [33, 59], our program combines individualized training of cognitive functions and social skills. The underlying assumption is that social and neurocognitive abilities have a biunivocal relationship: deficits in neurocognition may affect subject’s abilities in social life and viceversa, i.e. high levels of social anxiety and discomfort related to poor social abilities, may affect neurocognitive abilities. As a matter of fact, significant associations between specific cognitive deficits and role-play performance [1, 47], as well as community functioning [13, 14, 17], have been found. Based on this assumption, the two components are not proposed in a sequential order, but carried out in the same time frame. The primary hypothesis of the study is that after 6 months subjects assigned to the social skills and neurocognitive individualized training (SSANIT) will show less disability than those assigned to the structured leisure activities (SLA) of the attended psychiatric facility. Secondary hypotheses include an improvement in neurocognitive performance and in psychopathology negative dimension in the SSANIT but not in the SLA group.

Methods

The present pilot study is based on a controlled design including randomization to treatment groups, blind assessments and stable pharmacological treatment.

Subjects

Subjects were recruited among patients attending three psychiatric facilities located in the Italian region Campania: the Day Care Center of the Department of Psychiatry Avellino 1 and two Day Care Centers (Puglianello and Bucciano) of the Department of Psychiatry Benevento 1. The study was approved by the Ethics Committee of each Department of Psychiatry. Inclusion criteria were (a) a clinical diagnosis of chronic schizophrenia or schizoaffective disorder according to the DSM-IV criteria; (b) no hospitalization or symptom exacerbation or changes in medication in the last 3 months; (c) age between 18 and 60 years; (d) a minimum of 5 years of education; (e) no medical or neurological or developmental illness involving severe and/or long lasting disability; (f) no drug abuse in the last year; (g) willingness to participate in the study expressed by signing a written informed consent after a detailed presentation of all procedures. Twenty patients with these characteristics were identified in each center and randomly assigned to either the experimental rehabilitation

program (SSANIT) or to the SLA of each center. Randomization was independent of the study team.

Thirty patients (21 males and 9 females) were randomized to the SSANIT and 30 to the SLA (19 males and 11 females) group. Patients who dropped from the study before completing at least 1 month of the program did not complete a post-treatment assessment and were excluded from statistical analyses (Fig. 1).

All patients were chronic, with a moderate level of disability, a higher load of negative than positive and disorganization symptoms. All of them were treated with antipsychotics, standard or novel, or combination of both.

Study phases

The study included the following phases: (1) training of the personnel of the Day Care Centers (months 1–3); (2) baseline assessment of psychopathological, cognitive, personal and social functioning of patients enrolled in the study (months 4, 5); (3) SSANIT or SLA programs (months 5–10); (4) assessment of psychopathological, cognitive, personal and social functioning of patients after the 6-month rehabilitation interventions.

Training of the personnel of the Day Care Centers

Two nurses, a psychologist and a social worker were trained in each participating center. During the 3-month training this personnel attended ten 2-h sessions and became familiar with theory and practice of the SSANIT. After the training the personnel had to be able to design an

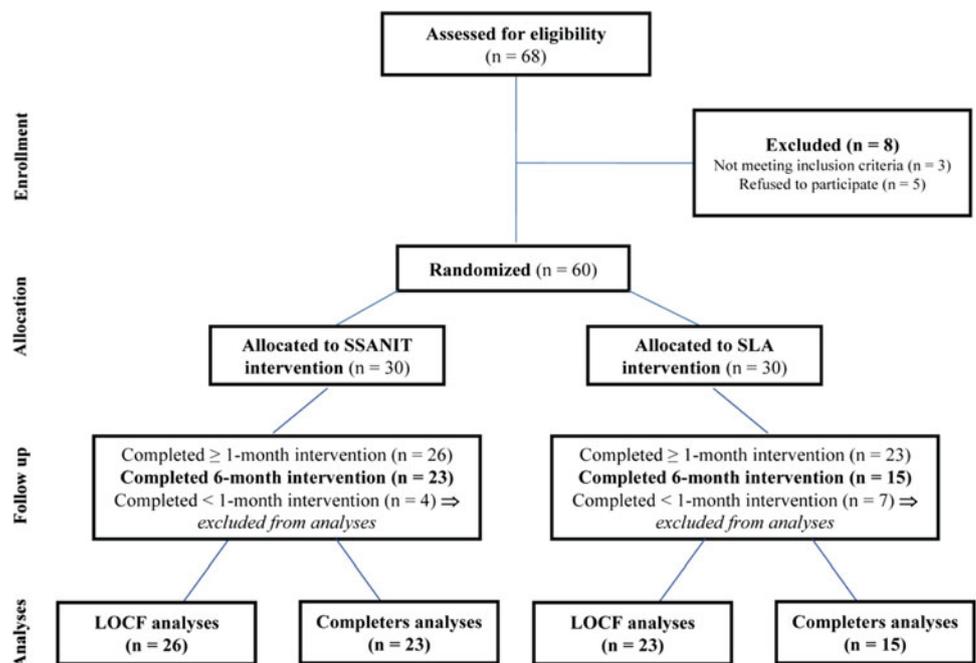
individualized SSANIT program for each patient, to be group trainer or co-trainer for the Social Skills and Neurocognitive component.

Baseline assessment of psychopathological, cognitive, personal and social functioning of patients

Psychopathology was assessed by the scale for the assessment of negative symptoms (SANS) [2] and the scale for the assessment of positive symptoms (SAPS) [3]. Five cognitive domains were evaluated: (a) general cognitive abilities, by means of one verbal and one non-verbal subtest of the Wechsler Adult Intelligence Scale Revised, i.e. Vocabulary and Picture Completion (the index provided by these two subtests [42] shows a high correlation with the WAIS-R total IQ [70]); (b) attention, assessed by the number of omission and commission errors of the Continuous Performance Test-AX [61]; (c) memory, evaluated by means of the number of delayed recalls on the WHO Auditory Verbal Learning Task [45] and the number of correct identifications on the WHO Picture Memory and Interference Test [46]; (d) executive functions, evaluated by the number of perseverative errors on the Wisconsin Card Sorting Test [31], by the number of interferences on the Picture Memory and Interference Test and by the index of cognitive flexibility of the Trail Making test (part B minus the part A time) [57]; (e) Verbal Fluency, assessed by the number of correct responses on the Category Instances [10].

The interview for the assessment of disability (AD) was administered to patients and integrated with the

Fig. 1 Flow diagram of the progress through the phases of the randomized trial. *SSANIT* Social skills and neurocognitive individualized training, *SLA* structured leisure activities, *LOCF* last observation carried forward



information obtained by social workers and psychiatrists to evaluate personal and social functioning [55]. The interview focused on subject's last month functioning in the following areas: Self-care, Underactivity, Slowness in task execution, Social withdrawal, Participation in family life, Affective and sexual relationships, Friction in interpersonal relationships outside home, Work performance, Interest in getting a job or in going back to work or studies, Interest and information, Behavior in emergencies or in out-of-the-ordinary situations that have occurred in the last 6 months and Global functioning.

Psychopathological, neurocognitive, and disability assessments were carried out by psychiatrists or trainees in psychiatry from the University Department, trained in the use of the instruments, who were blind to the group assignment, not involved in either SSANIT or SLA treatment and visited the centers in which the study was carried out only when psychopathological, neurocognitive, and disability assessments took place.

The social skills and neurocognitive individualized training

The individualized SST component of the SSANIT is aimed at improving individuals' social and emotional perception and expressiveness, as well as conversation skills. Training individual social and emotional perception and expressiveness promotes a positive attitude toward oneself and the others; in fact, it has been reported that these components of the SST improves assertiveness [38, 41], i.e. the ability to express emotions, feelings, needs and personal opinions clearly and effectively without excessive anxiety, discomfort or aggressiveness. The focus of this part of the training was on the ability to recognize and express unpleasant and positive feelings, apologize, and share fears. Conversation skills involve subject's ability to listen to others, start conversation, sustain conversation by asking questions, expressing own feelings and opinions and end conversation. The individualized SST component of the SSANIT uses the same ingredients described by Bellack et al. [7]: modeling, feedback, behavioral rehearsal with coaching and corrective/positive feedback, problem-solving exercises, in vivo exercises and homework assignments, but is designed in a highly individualized format and, together with behavioral aspects, it targets important aspects of social cognition (recognition and expression of feelings). Aspects of patients' real life are modeled into SST, as role play for the abilities to be developed is based on every day social context of each participant, who is asked to report a particular episode occurred to her/him recently at home or in other social contexts, relevant to the ability to be trained, in order to set up the role play. To promote generalization from the training to real life, patients' attempts to practice the

abilities outside the training group were carefully reviewed in the subsequent session, positive feedbacks were provided and eventual difficulties encountered by the person were discussed with the group.

Patients attended weekly 2-h sessions for 6 months (48 h).

The individualized Neurocognitive Training component of the SSANIT is based on a computer-assisted cognitive rehabilitation program, RehaCom, developed by the HASOMED GmbH (Inc., Ltd) in Magdeburg, Germany. The patient can work with RehaCom on a personal computer; a special keyboard with simple, large and clear keys is also available and was used in the present study. All training procedures automatically adapt in their difficulty to individual needs. Several levels of difficulties are available: if the subject is successful on one level, the program automatically proposes the next more difficult one, if the subject is wrong the program switches to the next easier level; the threshold for switching from one to another difficulty level is set by the trainer on the basis of the trainee cognitive abilities. Thus, the training remains always interesting and is never too demanding or too easy for the trainee. The motivation of the training person is also promoted by close-to-reality procedures and positive statements in the achievement feedback. The training data are registered and an immediate feedback on task performance gives the therapist and the patient the possibility of improving training strategies. RehaCom has been used more often for rehabilitation of neurological patients [18]. Recently Cochet et al. [16] reported that in patients with schizophrenia cognitive functions, interpersonal problems solving skills, social autonomy and symptoms were significantly improved by 14 training sessions using the RehaCom software.

The following training modules were used: "Attention and Concentration", "Verbal Memory", "Memory for faces", "Logical thinking", "Shopping" and "Day planning". For "Attention and Concentration" subject has to compare a picture with several other pictures to find the precise match for it; 24 levels of difficulties are available. In the "Verbal Memory" training the subject is presented with a story on the computer screen and is asked to remember its content; in the recall phase multiple choice questions are asked on the story; the number of questions vary according to ten levels of difficulty. "Memory for Faces" involves the presentation on the computer screen of unknown faces; subjects are asked to remember them; at the highest level of difficulty (21) subjects are required to remember not only faces but also related names, jobs and telephone numbers. For "Logical Thinking" the patient is presented with a series of pictures ordered according to a rule; after the patient has identified the rule, he must select the relevant picture from a matrix of pictures. Different

levels of difficulty (24) involve different length and complexity of the matrix. “Shopping” is very close to reality; the subject performs as if she/he were in a supermarket; she/he is asked to prepare a shopping list containing all the items to buy, to find them on the shelves of the supermarket, place them in the trolley and finally go to the cash desk to pay the bill; at the highest level (18) of difficulty the subject has to decide whether the money in her/his pocket is enough for the chosen items. “Day Planning” is also very close to reality; the subject has a list of appointments on one side of the screen and a map with nine buildings connected by streets and has to establish priorities, choose the shortest routes and try to accomplish most of the appointments in due time, according to 55 levels of difficulty.

For all the modules a post-session feedback is provided informing the trainer and the subject of the session outcome, i.e. the level of difficulty successfully performed by the subject. Subjects attended two 1-h sessions per week for six months (48 h).

Structured leisure activities

The SLA activities were carried out in group sessions and included Music training, Decoupage, Carpentry, and Potter’s earth manipulation in the Day Care Centre of Puglianello; Decoupage, Cooking, Physical training and Gardening in Bucciano; Cooking, Mosaics, Laboratories of wax handling and plaster cast and Gardening in Avellino. Patients assigned to the SLA group attended the activities for 4 h per week (96 h).

The SSANIT program was carried out, in each participating center, by a team including two Psychiatric Rehabilitation Technician (one for the social skills component and another for the neurocognitive one) from the Department of Psychiatry of the University of Naples SUN, supported by two nurses, a psychologist and a social worker from each Day Care Center.

The SLA activities were carried out by a team including a psychologist, two nurses and a social worker, with experience in the implemented SLA, supervised by experts in these fields.

Statistical data analysis

In order to be included in the analysis each patient had to have a retest after no <1 month of participation in the program. Eleven patients, three in the SSANIT (1 for consensus withdrawal and 2 for family problems) and eight in the SLA group (6 for consensus withdrawal and 2 for family problems) did not complete the study and were retested after a mean time in the study of 1.6 months (SD 0.67, range 1–3 months). Two sets of analyses were then

run: one including these 11 patients [last observation carried forward analysis (LOCF)] and one excluding them (completers analysis) (Fig. 1).

Eleven patients dropped from the study before 1 month of treatment and were not included in any statistical analysis. Four of them were from the SSANIT (2 for relapse of psychotic symptoms, 1 for consensus withdrawal, and 1 for death) and seven from the SLA group (2 for relapse of psychotic symptoms and 5 for consensus withdrawal). The LOCF analysis included 26 patients (19 males and 7 females) in the SSANIT group and 23 (14 males and 9 females) in the SLA group, while the completers were 23 (18 males and 5 females) in the SSANIT and 15 (9 males and 6 females) in the SLA group (Fig. 1).

Data distributions were examined for normality and homogeneity of variance. In cases in which these assumptions were violated, data were log transformed.

Group differences in gender distribution and treatment type (typical or atypical antipsychotics) were investigated by means of the Pearson χ^2 (the few subjects treated with an association of typicals and atypicals were included in the class “typical”); one-way ANOVAs were carried out to investigate group differences in age, education, duration of illness and age of onset.

Measures from the SANS and SAPS were grouped into three dimensions: (1) reality distortion (sum of global scores on the hallucinations and delusions subscales of the SAPS); (2) disorganization (sum of global scores on the formal thought disorder and bizarre behavior subscales of the SAPS); (3) negative symptoms (sum of global scores on the alogia and affective flattening); the two SANS subscales “avolition”, “anhedonia” and “attentional impairment” were not included in the sum, as the first two mainly evaluate aspects of social functioning, such as self-care and participation in social life, and the third one evaluates a cognitive domain; their inclusion might result in spurious correlations with psychosocial and neurocognitive indices. Scores on neuropsychological tests were inverted when needed, so that higher values always corresponded to worse performance.

For all psychopathological, neuropsychological and social disability indices, as well as for results of the neurocognitive training, z scores were computed by using mean and standard deviations from each group at baseline.

To deal with the problem of multiple comparisons, the following strategies were adopted: (1) ANOVAs were performed with multivariate or repeated measure designs as deemed appropriate, in which dependent variables were the global disability index or AD factor scores or psychopathological dimensions, neuropsychological indices or neurocognitive training results; (2) the Huyn–Feldt

correction for multiple comparisons was used when needed; (3) post hoc tests were carried out only in the presence of significant main effects or interactions in the multivariate test. Tukey's honest significant difference (HSD) procedure for unequal group size was used for post hoc comparisons.

For all statistical tests the level of significance was set at $P \leq 0.05$.

Results

Baseline differences between the SSANIT and the SLA group

LOCF

Baseline demographic and clinical findings are reported in Table 1. Results of group comparisons for psychopathological dimensions, general cognitive abilities and global disability are reported in Table 2. Education was the only variable showing a significant difference between the two groups ($F = 9.5$, $df = 1,47$, $P < 0.003$); it was significantly lower in the SLA than in the SSANIT group, and was therefore included as covariate in further statistical analyses. There was no significant Group effect ($F = 0.15$, $df = 1,47$, $P = 0.7$) or interaction ($F = 0.46$, $df = 2,94$, $P = 0.5$) for the psychopathological dimensions. The two patient groups did not differ on general cognitive abilities ($F = 0.85$, $df = 1, 46$, $P = 0.4$) or global disability ($F = 3.6$, $df = 1,47$, $P = 0.06$).

Table 1 Demographic, clinical, psychopathological, neuropsychological and psychosocial indices in SSANIT and SLA groups at baseline (mean \pm SD)

	SSANIT group ($N = 26$)	SLA group ($N = 23$)
Age (years)	40.31 \pm 8.77	39.17 \pm 8.71
Education (years)	11.69 \pm 3.49*	8.74 \pm 3.16
Age of illness onset (years)	24.19 \pm 8.92	25.00 \pm 6.69
Duration of illness (years)	15.73 \pm 7.40	14.17 \pm 7.14
Treatment (CPZ eq)	566.7 \pm 407.8	414.1 \pm 231.1
Disorganization	1.00 \pm 1.85	1.48 \pm 1.67
Positive symptoms	3.11 \pm 2.27	2.52 \pm 2.29
Negative symptoms	7.38 \pm 4.66	6.78 \pm 5.48
General cognitive abilities	12.61 \pm 5.75	9.30 \pm 4.50
Global disability	4.15 \pm 0.88	3.61 \pm 1.12

SSANIT Social skills and neurocognitive individualized training, SLA structured leisure activities

* $P < 0.003$

Table 2 Control ANOVAs in education-matched subsamples

Effect or interaction	F	df	P
ANOVA effects and interactions on global disability index			
Group	1.62	1,42	0.21
Time	0.01	1,42	0.93
Time \times group	4.90	1,42	0.03
ANOVA effects and interactions on neurocognitive indices			
Group	0.00	1,42	0.99
Time	10.83	1,42	0.002
Time \times group	1.81	1,42	0.19
Time \times group \times neurocognitive test	0.50	8,336	0.85
ANOVA effects and interactions on psychopathological indices			
Group	0.00	1,42	0.99
Time	2.94	1,42	0.09
Time \times group	0.72	1,42	0.40
Time \times group \times psychopathological dimension	1.70	2,84	0.19

Completers

No baseline difference between the two groups was found when running the analysis in completers only; consequently, post- versus pre-treatment analyses for these patients did not include any covariate.

Changes in psychosocial disability after 6 months of treatment

LOCF

Repeated measures MANCOVA on AD factors showed a significant interaction Time \times Group (Wilks' lambda ratio = 0.88, $F = 6.2$, $df = 1,46$, $P < 0.02$). Post hoc analysis showed that while the two groups did not differ at baseline, they did after treatment, with the SLA group scoring significantly worse than the SSANIT group (Tukey HSD, $P < 0.004$; Fig. 2). Repeated measures ANCOVA on global AD scores also showed a significant interaction Time \times Group ($F = 6.3$, $df = 1,46$, $P < 0.01$); post hoc analysis confirmed the findings observed for the AD factors, showing that at the endpoint global disability was significantly worse in the SLA than in the SSANIT group (Tukey HSD, $P < 0.02$; Fig. 2).

Completers

Repeated measures MANCOVA on AD factors revealed a significant interaction Time \times Group (Wilks' lambda ratio = 0.89, $F = 4.04$, $df = 1,36$, $P = 0.05$); post hoc analysis only approached significance in completers (Tukey HSD, $P = 0.06$).

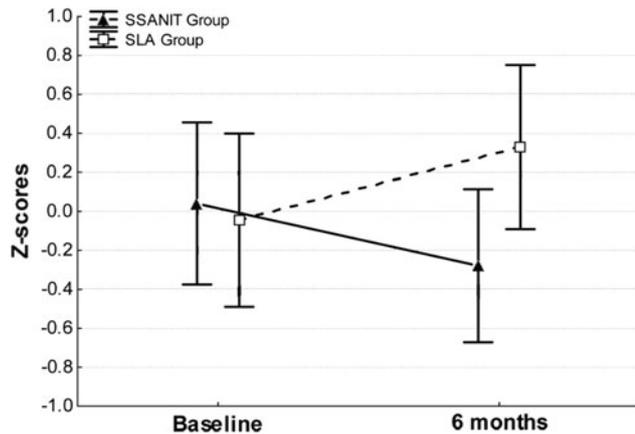


Fig. 2 Repeated measures ANCOVA on Global Disability scores: significant interaction Time × Group ($F = 6.3$, $df = 1,46$, $P < 0.01$). *SSANIT* Social skills and neurocognitive individualized training, *SLA* structured leisure activities, *Global Disability* global score on the interview for the assessment of disability. Vertical bars indicate confidence intervals (95%)

The repeated measures ANCOVA on global AD scores also showed an interaction Time × Group approaching significance ($F = 3.8$, $df = 1,36$, $P = 0.06$).

Changes in neurocognitive performance and psychopathological dimensions after 6 months of treatment

LOCF

MANCOVA showed no significant interaction Time × Group or Time × Test × Group in either neurocognitive performance or psychopathological dimensions.

Completers

A significant interaction Time × Neurocognitive Test × Group was shown by MANCOVA in Completers (Wilks’ lambda ratio = 0.54, $F = 3.5$, $df = 7,30$, $P < 0.007$). However, no significant change from baseline in either group or significant difference between the two groups at the endpoint was detected by the post hoc tests.

No significant interaction Time × Group or Time × Psychopathological dimension × Group was observed.

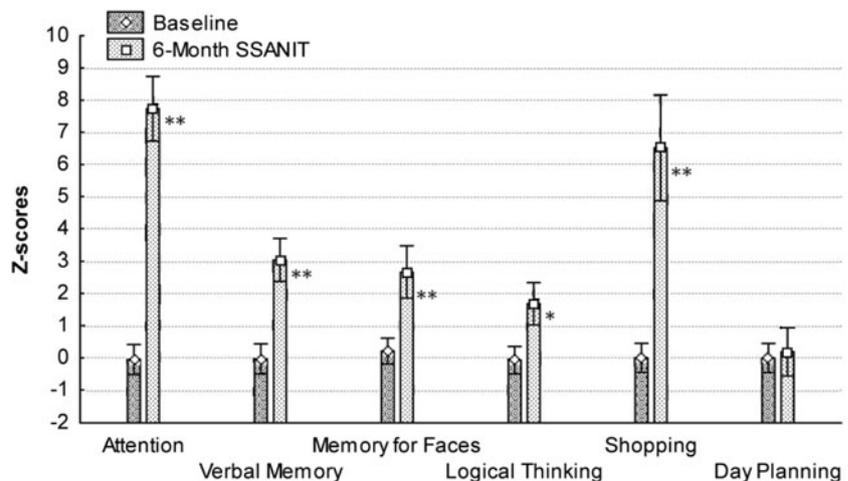
Improvement on RehaCom neurocognitive training

In patients assigned to the SSANIT group, the performance significantly improved on all RehaCom modules but “Day planning”. In the LOCF analysis, ANOVA with performance indices (achieved level of difficulty) as dependent variables and Time and RehaCom module as repeated measure factors indicated a significant effect of Time ($F = 247.9$, $df = 1,22$, $P < 0.000001$) and Time × RehaCom module ($F = 92.61$, $df = 5,110$, $P < 0.000001$), due to the fact that a performance improvement was observed after 6-month SSANIT neurocognitive training with respect to baseline for all modules (P from 0.00004 to 0.000001), but “Day Planning”. The same results were observed for the completers analysis (Fig. 3).

Control analyses

To further control for differences in education between the two groups, patients were matched for this variable on an individual basis and the LOCF analyses were repeated in the education-matched subsample. Results of these control analyses confirmed the pattern of results reported above (Table 2).

Fig. 3 ANOVA on RehaCom performance indices: significant interaction Time × RehaCom module ($F = 80.9$, $df = 5,95$, $P < 0.00005$). *SSANIT* Social skills and neurocognitive individualized training. * $P < 0.001$; ** $P < 0.000001$. Vertical bars indicate confidence intervals (95%)



Discussion

A greater efficacy of the SSANIT program, as compared to the SLA program, was found for the primary outcome measures, i.e. AD global score and factors: in fact, while no difference between the groups was detected at baseline, after the 6-month program patients assigned to SSANIT showed less disability than those assigned to SLA. A further advantage observed for the SSANIT group was the lower number of drop outs in comparison to the SLA group.

In the light of evidence that programs targeting both neurocognitive functions and social skills may be more effective than either intervention alone [33, 59], SSANIT combines individualized training of cognitive functions and social skills. The comparison group included patients with a similar degree of clinical, neurocognitive and social impairment participating in rehabilitation activities largely used in Italian Mental Health Departments, which do not specifically target cognitive functions or social abilities, but favor socialization by involving patients in vocational and leisure group activities. The two programs were matched for duration and frequency of sessions.

Differences between the two groups following the 6-month program cannot be explained by greater involvement of patients in either program, as the two programs were matched on duration and time spent in rehabilitation activities, or by raters' bias, as they were blind to patients group assignment and had no interaction with personnel of the day care centers involved in patients treatment or in rehabilitation activities. The possibility of greater staff motivation in either program was also discussed with researchers involved in the study, and thought to be a possible confounder deserving further investigation. In the present pilot study no formal evaluation of this variable was carried out; a high degree of satisfaction was verbally reported by personnel trained and involved in the SSANIT program, but no dissatisfaction was actually mentioned by those involved in the SLA program. However, in our opinion, in case greater motivation of personnel involved in the SSANIT program influenced the study results, it should not be considered as just a confounder, but as an important ingredient of the program success. The high number of drop outs and the worse outcome in program completers observed in the SLA group actually deserves attention, in the light of the large use of this type of rehabilitation activities in Italian Mental Health Departments and of the resources that they require. The greater efficacy of the SSANIT program is most probably due to its individualization and concomitant targeting of both cognitive and social abilities. Although also SLA engage patients in cognitive and social tasks, they do so without a gradual and individualized format, which is most probably of greatest

relevance to patients' social improvement. To the best of our knowledge, SSANIT is the only program available in Italy that provides both an individualized SST and individualized computer-assisted cognitive rehabilitation.

The program has shown superior efficacy in comparison with SLA in outpatients with chronic psychoses, a moderate degree of psychosocial disability and no drug dependence, which limits the possibility of extending our findings to all patients affected by chronic schizophrenic or schizoaffective psychoses.

The efficacy was limited to the disability outcome indices, while no advantage was observed for psychopathological and cognitive outcome indices. These negative finding might be due to the chronicity of patients psychopathology, to the prevalence of negative symptoms in their clinical picture and to the short duration of the training itself. The lack of significant effects on neurocognitive tests was unexpected, due to the observation that all patients improved in RehaCom tasks performance throughout the sessions, but this improvement did not translate into better performance on independent neurocognitive measures. This suggests a lack of generalization of cognitive improvement. This hypothesis is also supported by the lack of improvement on the RehaCom "Day planning" module, which requires a high degree of integration of most of the trained (attention, executive control, visuo-spatial abilities and memory) and non-trained functions (e.g., cognitive flexibility).

Several other studies found no effect of cognitive remediation on the investigated cognitive functions [9, 53, 54, 62, 73]. According to Medalia and Richardson [52], factors influencing a positive response to cognitive remediation include therapist training, as well as patient's motivation, intensity and type of training and baseline cognitive abilities. In our case, subjects' motivation is not likely to explain the negative finding, as subjects improved greatly on most training tasks, but failed to generalize to independent tests. The possibility that our findings were influenced by intensity and type of cognitive training (lack of inclusion of a cognitive flexibility training, for instance) and therapist training cannot be ruled out. As to patients baseline cognitive abilities, there is evidence that not all patients require the same length of treatment, with the most impaired apparently requiring more sessions than the others. Also this variable is not likely to explain our findings, as both the number and the frequency of the cognitive training sessions can be considered high. Future research in the field might greatly benefit from the adoption of a consensus battery, as proposed by Green and coworkers [26, 27] for studies aimed at discovering effective pharmacological treatments for cognitive impairment in schizophrenia, and a closer matching of trained and assessed functions.

The absence of an active control group (i.e. a treatment program without a combination of both approaches or without individualization of the training) might represent a limitation of the present study. However, in the light of recent evidence that programs combining both aspects have better impact on functional outcome [50], the comparison of the presumably best evidence based approach with current rehabilitation practices of most Italian Mental Health Departments was deemed appropriate. Disentangling the relative contribution of the program subcomponents was not a goal of the present investigation.

In conclusion, the study results showed higher efficacy of the SSANIT than of the SLA program after 6 months of activities. As for other integrated programs, also for SSANIT further studies are needed to verify generalization and persistence of the observed gains, and to clarify most adequate length and doses of the therapeutic intervention as well as the relative contribution of each program component to its impact on subjects' disability.

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