

Mechanisms of insight in schizophrenia and impact of cognitive remediation therapy

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Abstract

The origins of poor insight in schizophrenia are still unclear. We contrasted the changes in clinical insight, basic cognitive processes, autobiographical memory and metacognition in 63 outpatients with schizophrenia pseudo-randomly assigned to one of three cognitive remediation groups: one targeting basic cognitive processes (RECOs), a second autobiographical memory (REMAu), and a third metacognitive deficits (MBCT). Three dimensions of insight (awareness of: mental illness, benefit of treatment, psychosocial consequences) improved after treatment, regardless of the group. In addition, the REMAu and MBCT showed an improvement on other dimensions of insight (symptomatic awareness and symptomatic attribution, respectively). Poor insight and its improvement after treatment were best predicted by a combination of basic cognitive, autobiographical and metacognitive measures. This study supports a multidimensional conception of insight and recommends the combination of remediation therapies to improve clinical insight in schizophrenia.

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1. Introduction

In psychiatry, insight refers to the patients' awareness and understanding of their feelings, behaviors, attitudes, and symptoms. Contemporary conceptualizations of "insight" are multidimensional and define it as current and retrospective awareness of having a mental illness, of the need of treatment, of the social consequences, of the specific symptoms, and the attribution of specific psychotic symptoms [1]. The phenomenon of insight is therefore essential to the coverage of schizophrenia, given its connection with drug adherence [2], psychosocial functioning [3,4], the general evolution of the illness [5] and the admission status for hospitalizations (see [6] for a review; [7]).

To be more precise, a high level of insight is important to the patient, given that it offers the possibility to cope with something successfully identified and known, such as the illness. The identification process allows the acceptance and knowledge of the illness, which restore the feeling of self-control, and disease control, but also the ability to handle complex social situations. Thus, insight might be assumed as a narrative act in which people are making meaning of life.

Some approaches have been developed to increase patients' knowledge and insight of their illness and treatment. Xia, Merinder and Belgamwar (for review, [8]) reported that psychoeducation seemed to slightly reduce relapse and readmission, encourage medication compliance, and reduce the length of hospitalization. However, the results on insight were not conclusive. Otherwise, cognitive therapy has been proposed with more success in improvement of insight. For instance, Rathod et al. [9] demonstrated that cognitive behavioral therapy (CBT, [10]) leads to significant improvement in some components of insight. Only two subscales improved following CBT: compliance with treatment and ability to re-label psychotic symptoms. This suggests

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therefore that further efforts are needed to better understand factors contributing to insight and find strategies to help patients develop their insight.

Studies have tried to explain the lack of awareness often associated with schizophrenia. Three main neuropsychological perspectives have dominated research. They have drawn attention to the links between insight and either basic cognitive functions, autobiographical memory, or metacognition to understand the cognitive mechanisms of insight in schizophrenia. Among the basic cognitive deficits in schizophrenia patients, poor insight has mainly been associated with deficits in executive functioning [11–13], especially in mental flexibility, abstract reasoning, and self-reflection [14]. However, some studies have failed to find this relationship (e.g., [15]). Links between insight and other aspects of cognition such as attention and memory have also been investigated but have produced mixed results. Some studies have found a relationship between poor insight and measures of attention [16], unlike others [13,17–19]. Previous studies have attempted to link unawareness of the illness to memory impairments in schizophrenia (for a meta-analysis, see [20]). They show that some level of memory functions may be necessary for intact insight.

Otherwise, Larøi et al. [21] have pointed that poor insight is associated with deficits of the subjective experience of remembering (autonoetic consciousness) which accompanies the recollection of contextual details of a particular autobiographical event [22]. Disorders in autobiographical memory within schizophrenia are widely reflected in literature [23–25]. Patients recall few specific autobiographical memories [26], with degraded autonoetic consciousness [25], and the deficit is more marked in late adolescence and early adulthood memories, or after the onset of the disease [26]. As recent theoretical models propose that autobiographical memory grounds personal identity [27–29], autobiographical memory and autonoetic consciousness deficits, would be related to a disturbed sense of self and/or poor personal identity in schizophrenia [25,30]. Despite these alleged links, to date no study has explored them in schizophrenia.

Finally, some authors have showed that poor insight is correlated to metacognitive deficit [31,32]. Metacognition [33] refers to specific processes or discrete judgments about self and others such as making inferences from others' speech and behavior about their motives, intentions, affects or internal states (i.e., processes described in "theory of mind"). It also includes more synthetic processes integrating these discrete judgments into a larger whole. These synthetic processes point to the extent to which a person constructs increasing complex and integrated representations of themselves and others; the extent to which a person can situate himself/herself and others in the larger social world, and use that knowledge to respond to challenges [34–36].

The aim of the present study was to better understand the links between insight and basic cognitive, autobiographical memory and metacognitive skills and how gains in these

functions could improve insight in schizophrenia. In a pseudo randomized trial, we evaluated the pre/post effects on insight and basic cognitive, autobiographical memory and metacognitive skills of three therapeutic programs targeting specific deficits: cognitive basic disorders for RECOs — Cognitive Remediation for Schizophrenia; autobiographical memory deficits for REMAu — Autobiographical Reminiscence therapy; and metacognitive deficits for MBCT — Mindfulness-Based Cognitive Therapy. We sought to test the following specific hypotheses on pre-remediation assessment:

- (1) Poor insight would be more correlated with metacognitive than basic cognitive functioning [31,37], and would be correlated with autobiographical memory [21].
- (2) The dimension *symptomatic awareness* would be linked to basic cognitive functioning [38] and metacognition [31], whereas the dimension, *symptomatic attribution* would be linked to self-consciousness, introspection abilities and memory processes [38]. The three others dimensions of insight (i.e. awareness of: mental illness; psychosocial consequences and benefit of treatment), would be more dependent of external factors such as social and cultural variations [39].

We assumed that the three therapeutic approaches would improve insight, however the impact was expected to be variable on the level and dimensions of insight depending on the therapeutic group. Thus, the following specific hypotheses were tested on post-remediation assessment:

- (3) RECOs would be more effective in increasing the basic cognitive functioning than insight. However, knowing that *symptomatic awareness* is strongly linked to cognitive impairment [38,40], we assumed that the program would improve this dimension of insight.
- (4) REMAu would be effective in improving the quality of autobiographical recollection, and insight. We have no specific hypotheses concerning the improvement of the dimensions of insight.
- (5) MBCT would be effective in increasing metacognition and insight [41]. Knowing that consciousness of one's self is important for initial evaluation of any changes in mental state to subsequently search for attributable factors for these changes [38], we assumed that the program would improve the *symptomatic attribution* dimension.

2. Methods

63 outpatients with schizophrenia (44 men and 19 women) were recruited at the Young Adults Centre at the Paris Society for Mental Health Help (SPASM). Patients met the following criteria: age between 18 and 25 years,

Table 1
Clinical and Demographic Characteristics of Patients in All Groups at baseline.

| | REMAu (N=20) | | RECOS (N=21) | | Mindfulness (N=22) | | F= | p= |
|-------------------------|--------------|------|--------------|------|--------------------|------|------|------|
| | Mean | (SD) | Mean | (SD) | Mean | (SD) | | |
| Age | 22.5 | 1.4 | 22.6 | 1.5 | 22.7 | 1.4 | 0.08 | 0.96 |
| Gender (M/F) | (11/9) | / | (11/10) | / | (14/8) | / | 1.71 | 0.17 |
| Handedness (L/R) | (4/16) | / | (5/16) | / | (3/19) | / | 0.35 | 0.70 |
| Duration of illness (Y) | 5.9 | 2.6 | 6.8 | 3.2 | 6.9 | 1.9 | 0.86 | 0.42 |
| Relapses | 2.5 | 1.3 | 3.0 | 1.5 | 2.4 | 1.1 | 1.23 | 0.29 |
| Premorbid IQ | 101.7 | 11.8 | 98.4 | 10.6 | 100.1 | 11.0 | 0.42 | 0.65 |
| PANSS Positive | 18.5 | 7.7 | 20.1 | 6.5 | 21.5 | 6.9 | 1.16 | 0.31 |
| PANSS Negative | 19.5 | 7.0 | 19.5 | 7.4 | 22.3 | 7.6 | 1.72 | 0.18 |
| PANSS General Psy. | 27.5 | 9.7 | 28.3 | 10.6 | 29.7 | 11.6 | 1.83 | 0.16 |
| PANSS G12 | 4.1 | 1.0 | 4.2 | 1.1 | 4.4 | 1.0 | 0.55 | 0.57 |

RECOS: Cognitive remediation program for patients with a schizophrenia spectrum disease; REMAu: Autobiographical Reminiscence Therapy; Minful: Mindfulness-Based Cognitive Therapy; SD: standard deviation; M/F: male/female; L/R: left/right; Y: Years; PANSS: The Positive, Negative and General Psychopathology Syndrome Scale; PANSS G12: subscale of awareness of illness.

atypical antipsychotics medication, and stable phase of illness. The diagnosis confirmation was made by a clinical psychiatrist for all patients, using the DSM IV [42]. The symptoms of these patients were assessed using the Scale for the Assessment of Positive, and Negative Symptoms (PANS; [43]). Three remediation therapy groups (RECOS, REMAu and MBCT) were constituted, matched on age, gender, handedness, premorbid IQ, and duration of illness or relapses. Demographic and clinical characteristics of the participants are shown in Table 1. The study was approved by the local Research Ethics Committee. All

subjects gave informed, written consent to participate in the study.

2.1. Procedures

Each patient underwent one of the three programs. Group allocation was pseudo-randomized according to patient availability. They were assessed at baseline (t0) 1 week before, and 1 week after three remediation programs (t1) see Fig. 1. The test battery was the same for the three groups and comprised clinical and cognitive assessments.

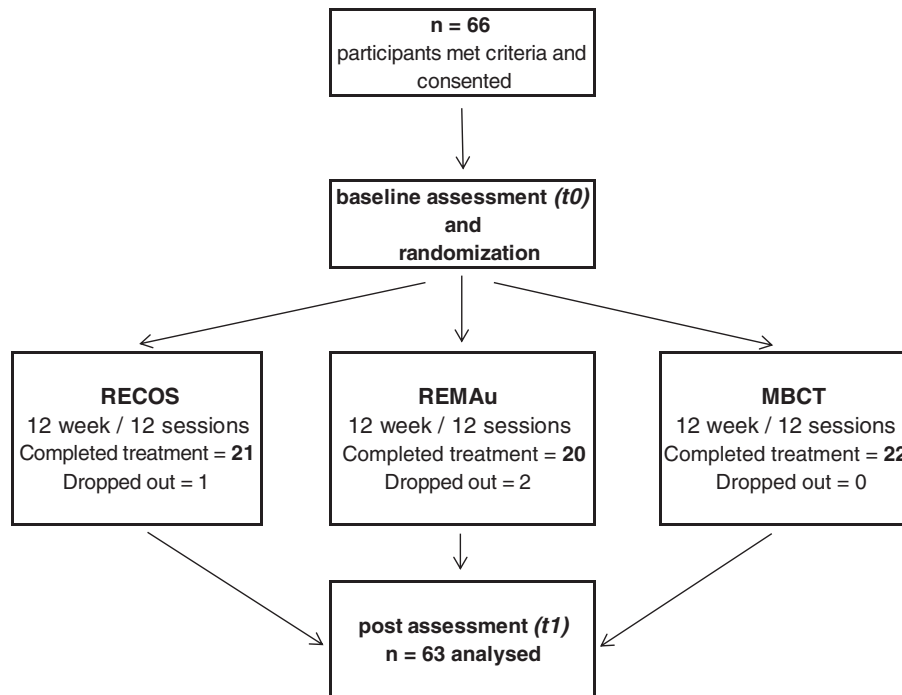


Fig. 1. Flow chart showing participant recruitment and treatment allocation. RECOS: Cognitive remediation program for patients with a schizophrenia spectrum disease; REMAu: Autobiographical Reminiscence Therapy; Minful: Mindfulness-Based Cognitive Therapy; t0 (pre-therapy); t1 (post-therapy) cognitive and clinical assessment.

2.2. Clinical and cognitive assessments

2.2.1. Insight assessment

Insight was measured with the Scale to assess Unawareness of Mental Disorder (SUMD, [44]). This scale measures several linked but separable dimensions of insight: awareness of having a mental illness, need of treatment, social consequences, specific symptoms, and symptomatic attribution. To be noted: the lowest score of SUMD scale and subscales corresponds to a good capacity of insight.

2.2.2. Basic cognitive assessment

A battery of standardized neuropsychological tests was administered to all participants to assess basic cognitive deficit. Three cognitive domains were established: (1) attention & processing speed were assessed via : Stroop: Word and Colour scores [45], Digit-Symbol-Coding (WAIS-III, [46,47]), Digit Span Order (WAIS-III, [46,47]), Trail Making Test: Number Sequencing subtest score (TMT A, [48]); (2) episodic memory via: California Verbal Learning Test-II (CVLT-II, [49]) List A Trial 1 recall, Short Delay Free and Cued Recall, Long Delay Free and Cued Recall, Total recall, recognition and discriminability, Rey Osterrieth Complex Figure [50]; (3) working Memory & executive functions via : Stroop: Interference score, Wisconsin Card Sorting Test [51,52]: number of categories achieved, percentage of errors and perseveration errors, WAIS-III: Digit Span backward, Letter-Number Sequencing, Digit Symbol, Verbal Semantic and Letter fluency task [53], Rey figure: copy score and planning, TMT B: difference between (B-A), CVLT: intrusion, perseveration, semantic clustering.

To reduce the number of dependant variables three composite scores were computed. Each individual neuropsychological variable was converted to a Z score, and then averaged to form the final composite Z score for each cognitive domain.

2.2.3. Autobiographical memory assessment

The TEMPau task (for a review [54]; adapted to Schizophrenia in [25]) was used to assess episodic autobiographical memories, taking into account not only their specificity but also the subjective experience of remembering (i.e., auto-noetic consciousness). The TEMPau task tested the recall of autobiographical memories, from four periods covering the entire life span: 0–9 years (1), 10–19 years (2), more than 20 (3), the last 12 months (4). Each memory of the four lifetime periods was assessed via a standard episodic scale based on the uniqueness and the shortness of the recalled event, and the specificity of details. We assessed the strictly episodic score per period taking into account memories characterized by specificity and richness of details (i.e. unique event lasting less than a day, with spatial and temporal location) and the reliving of affective-sensory-perceptual details via auto-noetic consciousness.

2.2.4. Metacognitive assessment

Several scales were used to assess metacognitive abilities. The Tennessee Self Concept Scale (TSCS-II, [55]; French version, [56]) was used to measure self-perception. We used the total Self Concept score, which computes the global positive self-perception (or self-esteem) regarding five specific areas of experience (Physical, Moral and Ethics, Personal, Family, Social) and three supplementary scores to reflect how people describe themselves when they are referring to who they are (identity score), how content they are with themselves (satisfaction score), and how they act (behavior score). Higher scores indicated higher positive self-perception. The Private Self subscale of the Revised Self-Consciousness Scale (RSCS: French version, [56]) measures the tendency to introspection, that is to say, the subject's ability to focus on oneself from a personal viewpoint, such as one's thoughts and feelings. A higher score indicates better introspection. A subjective TOM scale, derived from Duval et al. [57], encompassed a cognitive ToM subscale that measured the ability to understand, infer or interpret the cognitive mental states of others and an affective ToM subscale that measured the ability to infer or understand the feelings of others, or to act in response to emotions observed in other people. Two subscores, cognitive and affective, and one total score of ToM were obtained and used, with higher scores associated with greater ToM abilities.

2.2.5. Subjective complaints assessment

Three scales were used to assess diverse domains of subjective complaints. The Subjective Scale to Investigate Cognition in Schizophrenia (SSTICS, [58]) was used to evaluate subjective complaints about the cognitive deficits, consistently reported in schizophrenia. A total score was calculated, bringing together the four cognitive areas: memory, attention, executive functions, and praxia. The Cognitive Difficulties Scales (CDS, [59]) is a self-report questionnaire of perceived cognitive difficulties as manifested in activities of daily living. There are 39 statements relating to cognitive disorders such as concentration, attention, memory, expression, praxis and others. We calculated a total score, combining all cognitive areas. To reduce the number of dependant variables, one composite cognitive complaints score was constructed, comprising: the total SSTICS and CDS scores.

The Mindful Attention Awareness Scale (MAAS, [60]) was used to assess a core characteristic of dispositional mindfulness, namely, open or receptive awareness of and attention to what is taking place in the present. The scale shows strong psychometric properties. The total score was obtained, with a higher score associated with greater receptive awareness in the present moment.

2.3. Remediation programs

Three standard therapeutic interventions contained 12 sessions of 1 h a week with a therapist plus 30 min of

exercises done at home. The latter aimed at facilitating the generalization of the experiences and the patient's progressive autonomy. The programs RECOs and REMAu were conducted on individual basis, while the Mindfulness program was administered in groups consisting of 8 to 10 patients by session.

The Cognitive Remediation program for patients with Schizophrenia (RECOs, [61–63]) has been developed at the Psychiatric Department of the Vaudois University Hospital “Centre Hospitalier Universitaire Vaudois” (DP-CHUV) in Lausanne. The cognitive remediation includes five modules of training: reasoning, verbal memory, visuo-spatial, working memory, and selective attention. According to the patient's most overdrawn cognitive deficits, two modules of specific trainings are chosen. Every training module contains paper/pen and interactive CD-ROM exercises. The paper/pen sessions involve the elaboration of the cognitive strategies which will later be applied to the computerized exercises and to everyday life. Paper/pen exercises have been adapted to the patients and were linked with the three objectives of the program: treatments, relevance and motivation. Computerized modules contain several exercises consisting of 10 levels of difficulty each. All levels correspond to subject's current individual skills. The program includes a psycho-educative part, aiming to educate the patients on the cognitive disorders, and their impact on everyday life.

The Autobiographical Reminiscence Therapy (REMAu, [64]) program, initially conceived for the treatment of Alzheimer's disease, aims at the reconstruction of the feeling of identity and personal integrity via recovery of autobiographical memory. Based on Conway's model [27], the program first targets personal semantic knowledge, with the aim to reconstitute some general facts and information, thus allowing to recover knowledge about four various periods of life, and secondly it targets the access to more concrete and specific episodic memories. The initial four sessions were dedicated to the collection of personal information (names of people, school or work, important dates and personal addresses) within predefined four life periods, similar to the TEMPau [25,54]. We adapted the collection of data by adding questions about books, children's tales, comics, television programs, cartoons and music excerpts. The following six sessions were dedicated to the reviviscence of the episodic autobiographical memories cued by personal information. Moreover, cards illustrating various aromas allowed the patients to choose one or several aromas which could lead to the evocation of a specific event in their memory.

The primary aim of Mindfulness-based Cognitive Therapy (MBCT, [65]), developed by Segal and colleagues for chronic depression, is to prevent depressed mood that often heralds the onset of relapse. Mindfulness interventions teach patients to become increasingly more attentive to the present moment by engaging in a state of attentiveness to observe their inner thoughts and feelings as well as their outer world

of actions and perceptions. Mindfulness requires that individuals become fully aware of their perceptual experiences, and create a sense of balance and tolerance for their conscious experience. Educational interventions may include discussion of attachment and aversion, suspending, judgment, changing relationships between mood and thought. Formal methods of mindfulness practice include: meditation and breathing exercises [66]. In all stages of therapy, patients are encouraged to remain intently focused on staying present and being in the moment instead of being preoccupied with undesired experiences (e.g., hallucinations, unwanted memories, or thoughts). For example, patients with hallucinations are trained to accept the presence of the voices and to shift their attention to them while adopting a nonjudgmental and indifferent attitude, leading to the voices being less distressing and less intrusive.

2.4. Statistical analysis

First, we carried out a series of correlation and regression analysis on measures collected on pre and post remediation assessments, and then a series of analysis of variance assessing the specific effects of the kind of remediation therapy.

Bravais–Pearson's correlations were calculated between each subscale of the SUMD and possible relevant variables, i.e. cognitive assessments, autobiographical memory, metacognition and subjective complaints in baseline assessment ($t0$) for all three groups. We used a sequential set of multiple regression analyses to evaluate the relative importance of each below model: (1) basic cognitive variables (attention & processing speed, episodic memory, executive function); (2) autobiographical memory variables on four periods (0–9 years; 10–19 years; >20 years and last 12 months); (3) metacognitive variables (theory of mind total score, self-total score, self-satisfaction/behavioural/identity, introspection) to the prediction of poor insight. The subjective complaints score is not part of the predictive models of insight and was not included in this analysis. Otherwise, change in components of insight was calculated by subtracting the follow-up scores from the baseline scores ($t1-t0$). In order to measure the best model predictor variables for the improvement of insight after all three treatments, correlation and regression analyses similar to ($t0$) were applied. Finally, to assess the best predictors of improved insight dimensions, we conducted additional analyses using stepwise forward regression, where the two best predictors were selected.

A series of Repeated Measures Analysis of Variance (ANOVA) was then computed on all the variables taking into account the effect of the group (RECOs, REMAu, MBCT) as a between factor, and the effect of the session (pre/post effect) as a within factor. For autobiographical measures, the effect of lifetime periods (0–9 years old, 10–19 years old, more than 20, last 12 months) was included in the ANOVA. Post hoc analyses were computed via Tukey tests.

3. Results

3.1. Correlation and Regression analysis between the SUMD and possible relevant variables

3.1.1. Correlation analysis (t0) (Table 2)

The memory composite score was significantly associated with awareness of treatment need. The episodic score in first (0–9 years) and third (>20 years) lifetime periods was significantly and negatively associated with all SUMD subscales, except the awareness of treatment need. ToM total score was significantly and negatively associated with all subscales score of insight except the awareness of psychosocial consequences. Otherwise, better self satisfaction and more subjective complaints were associated with the best awareness of treatment need, while a good introspection ability was linked to better symptomatic awareness.

3.1.2. Correlation analysis between the change in components of insight and possible change of relevant variables: before/after treatment (t1–t0) (Table 2)

The improved awareness of mental illness was significantly correlated with the better episodic recall in the last

12 months period. The change of awareness of treatment need was nonsignificantly correlated with the change of relevant variables. The increased awareness of psychosocial consequences was associated with better mentalization abilities (ToM), while the improvement of symptomatic awareness was related to better episodic recall in three lifetime periods (0–9 years; >20 years; last 12 months) and executive functions. The symptomatic attribution was improved with improvement in the episodic score in the >20 years life period, introspection abilities, and awareness of the present moment (MAAS score).

Fig. 2 (A and B) presents the amount of variance in insight accounted for by each set of three kind of predictors, separately (i.e., independent of the other set of predictors) and uniquely (i.e., over and above the variance explained by the set of all three). We presented here only the significant scores at .05.

3.1.3. Four predictors model of insight subscales scores (t0) (Fig. 2, A)

As can be seen, firstly basic cognitive model accounted for a rather small proportion of variance in

Table 2

Bravais–Pearson’s correlation coefficients between basic cognitive, autobiographical memory, metacognitive, subjective complaints variables and insight subscale scores in pre evaluation (t0) and in treatment changes between before and after treatment (t1–t0).

| | Bravais–Pearson’s correlation coefficients with insight (t0); treatment changes (t1–t0) | | | | | | | | | |
|----------------------------------|-----------------------------------------------------------------------------------------|---------|---------------------|--------|------------------------|---------|------------------|---------|--------------------|---------|
| | Awareness mental illness | | Awareness treatment | | Awareness psy. conseq. | | Sympt. Awareness | | Sympt. Attribution | |
| | t0 | t1–t0 | t0 | t1–t0 | t0 | t1–t0 | t0 | t1–t0 | t0 | t1–t0 |
| All three groups | | | | | | | | | | |
| Basic cognitive functions | | | | | | | | | | |
| Attention & Processing Speed | (.15) | (–.13) | (.16) | (.10) | (.06) | (–.19) | (.04) | (–.15) | (–.04) | (–.05) |
| Memory | (.01) | (.18) | (.35*) | (.15) | (–.17) | (.09) | (–.18) | (–.13) | (–.09) | (.17) |
| Work. Memory & Ex. Functions | (.17) | (.09) | (.21) | (.04) | (.10) | (.05) | (–.05) | (–.30*) | (–.00) | (.11) |
| Autobiographical memory | | | | | | | | | | |
| (1) 0–9 age: Episodic sc. | (–.29*) | (–.19) | (–.02) | (–.04) | (–.33*) | (.07) | (–.34*) | (–.37*) | (–.38*) | (.09) |
| (2) 10–19 age: Episodic sc. | (–.05) | (–.01) | (–.03) | (.14) | (–.15) | (.12) | (–.22) | (–.24) | (–.11) | (.01) |
| (3) >20 age: Episodic sc. | (–.39*) | (–.13) | (–.08) | (.08) | (–.29*) | (–.11) | (–.41*) | (–.46*) | (–.37*) | (–.26*) |
| (4) 12 last months: Episodic sc. | (–.09) | (–.26*) | (–.06) | (.01) | (–.10) | (–.06) | (–.02) | (–.31*) | (–.10) | (–.11) |
| Meta-cognition | | | | | | | | | | |
| ToM Total score | (–.34*) | (–.02) | (–.36*) | (–.21) | (–.24) | (–.26*) | (–.36*) | (–.08) | (–.38*) | (–.15) |
| Cognitive & Affective | | | | | | | | | | |
| Self Total score | (.05) | (–.06) | (–.02) | (–.07) | (.03) | (.00) | (–.14) | (.22) | (–.13) | (–.16) |
| Identity | (–.09) | (.03) | (–.04) | (–.07) | (–.03) | (–.18) | (–.08) | (.11) | (–.11) | (–.04) |
| Satisfaction | (–.10) | (.00) | (–.36*) | (–.22) | (–.12) | (–.08) | (–.18) | (.21) | (–.15) | (–.06) |
| Behavior | (.04) | (.18) | (–.02) | (.01) | (.05) | (.05) | (.00) | (.02) | (–.06) | (.06) |
| Introspection | (–.13) | (–.12) | (–.20) | (.05) | (–.14) | (–.21) | (–.29*) | (–.01) | (–.21) | (–.31*) |
| Subjective complaints | | | | | | | | | | |
| SSTICS & CDS : Total score | (–.13) | (–.14) | (–.49*) | (–.02) | (–.19) | (–.12) | (–.11) | (–.08) | (–.23) | (–.09) |
| MAAS : Total score | (–.18) | (–.01) | (–.03) | (–.09) | (–.01) | (–.20) | (–.06) | (.23) | (.05) | (–.40*) |

Reference : sc.: score; p: p-value; t0 : before therapy; t1–t0 : treatment changes; psy: psychosocial ; conseq: consequences ; Sympt.: Symptomatic; All three groups: RECOS: Cognitive remediation program for patients with a schizophrenia spectrum disease, REMAu: Autobiographical Reminiscence Therapy, Mindful: Mindfulness-Based Cognitive Therapy; Attention & Processing Speed: Stroop: Word and Color page score, Digit-Symbol-Coding and Digit Span Order (WAIS-III), Trail Making Test (TMT A); Memory: California Verbal Learning Test-II (CVLT-II); Delis et al., 2000) List A Trial 1 recall, Short Delay Free and Cued Recall, Long Delay Free and Cued Recall, Total recall, recognition and discriminability, Rey Osterrieth Complex Figure (Rey & Osterrieth, 1993) delay accuracy; Working memory & Executive Functions: Stroop: Interference score, Wisconsin Card Sorting Test: number of categories achieved, percentage of errors and perseverative errors, WAIS-III: Dicit Span backward, Letter-Number Sequencing, Digit Symbol, Verbal Semantic and Letter fluency task, Rey figure: copy score and planning, TMT B: difference between (B-A), CVLT: intrusion, perseveration, semantic clustering; SSTICS: The Subjective Scale to Investigate Cognition in Schizophrenia ; CDS: The Cognitive Difficulties Scales; MAAS: The Mindful Attention Awareness Scale.

Significance: p < .05*.

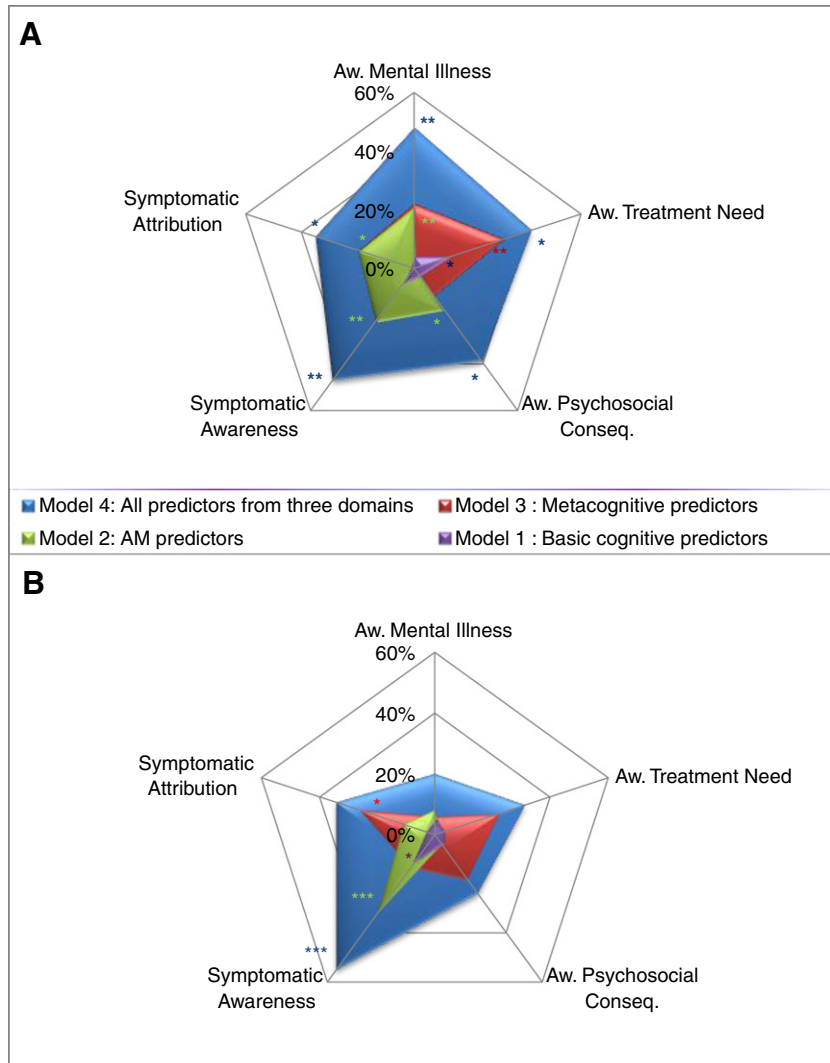


Fig. 2. (A) Four predictor models of the SUMD subscales in pre-remediation assessment (*t*₀). (B) Four predictor models of the change in components of insight after treatment (*t*₁–*t*₀). Basic cognitive predictors: Attention, Memory and Executive Functions; Autobiographical memory (AM) predictors: strictly episodic score from four life periods (0–9 years, 10–19 years, more than 20, the last 12 months); Metacognitive predictors: total score (self-esteem), Identity, Satisfaction and Behavior scores of self-concept scale, Introspection score of the Private Self subscale, Cognitive and Affective ToM subscales; All predictors from three domains : Cognitive, Autobiographical and Metacognitive; Aw.: Awareness; Cons.: Consequences. Significance: *p* < .05*; *p* < .01**; *p* < .001***.

poor insight (13% awareness of treatment need). Secondly, the autobiographical memory model as predictors accounted for small (17% awareness of psychosocial consequences) to moderate (22% symptomatic awareness, 20% symptomatic attribution, 21% awareness of mental illness) portions of the variance in poor insight. The third, metacognitive model, accounted for moderate (32% awareness of benefit of treatment) portions of the variance in poor insight.

When predictors from three domains entered in a final model the amount of accounted variance reached significance in four insight subscale, respectively 48% awareness of mental illness, 42% awareness of benefit of treatment, 39% awareness of psychosocial consequences, and 47% symptomatic awareness.

3.1.4. Predictors of improved insight subscales scores (*t*₁–*t*₀) (Fig. 2, B)

The basic cognitive model related to a small proportion of variance in insight (12% symptomatic awareness), while the autobiographical memory model and the metacognitive model accounted for moderate portion of the variance in insight (32% symptomatic awareness and 26% symptomatic attribution, respectively). When predictors from three domains were entered in a final model, the latter accounted for a high (55% symptomatic awareness) proportion of the variance in insight.

Finally, to assess the best predictors of improved insight, we conducted additional analyses using stepwise forward regression, where the two best predictors were selected. The best predictors (or predictor) of : (1) awareness of mental illness (10%; *F*(2,60)=3,54; *p* < .03) were the last lifetime

Table 3

SUMD mean score, and standard deviation, by Group before (*t0*) and after (*t1*) therapy, and three Interventions effect on Insight subscales scores. One-way, and two-way ANOVA interaction.

| Groups | RECOS Rc (N=21) | | REMAu Rm (N=20) | | Mindful Md (N=22) | | Group effect F (p<) | Session F (p<) | Group × Session F (p<) |
|------------------------|-----------------|------------|-----------------|------------|-------------------|------------|------------------------|-------------------|---------------------------|
| | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) | | | |
| | <i>t0</i> | <i>t1</i> | <i>t0</i> | <i>t1</i> | <i>t0</i> | <i>t1</i> | | | |
| Aw. mental illness | 3.95 (0.5) | 3.76 (0.6) | 3.65 (0.7) | 3.40 (0.6) | 3.81 (0.5) | 3.63 (0.7) | n.s. | 13.2 (***) | n.s. |
| Aw. treatment need | 3.09 (0.7) | 2.68 (0.7) | 2.85 (0.9) | 2.65 (0.9) | 2.95 (0.7) | 2.77 (0.6) | n.s. | 4.7 (*) | n.s. |
| Aw. psychos. Cons. | 3.33 (0.7) | 2.95 (0.6) | 3.30 (1.1) | 2.85 (1.1) | 3.63 (0.8) | 3.04 (0.9) | n.s. | 44.1 (***) | n.s. |
| Symptomatic Aw. Total | 3.40 (0.1) | 3.30 (0.1) | 3.19 (0.5) | 2.30 (0.5) | 2.88 (0.7) | 2.84 (0.8) | n.s. | 50.6 (***) | 2.9 (*) |
| Symptomatic Att. Total | 3.39 (0.6) | 3.28 (0.5) | 3.30 (0.6) | 2.82 (0.6) | 3.65 (0.6) | 2.63 (0.6) | n.s. | 79.8 (***) | 7.0 (**) |

RECOS: Cognitive remediation program for patients with a schizophrenia spectrum disease; REMAu: Autobiographical Reminiscence Therapy; Minful: Mindfulness-Based Cognitive Therapy; Aw: Awareness; psychos: psychosocial; cons: consequences; Att: Attribution; SD: standard deviation; SUMD: Awareness of Illness scale; *t0*: before therapy; *t1*: after therapy; F: the ANOVA F-statistic; *p*: p-value; n.s.: non-significant.

Significance: *p* < .05*; *p* < .01**; *p* < .001***.

period (12 last months) and episodic memory composite score; (2) awareness of benefit of treatment (18%; $F(2,60) = 5.04$; $p < .003$) were cognitive ToM score, and self-satisfaction; (3) awareness of psychosocial consequences (7%; $F(1,61) = 4.68$; $p < .03$) was uniquely affective ToM score; (4) symptomatic awareness (28%; $F(2,60) = 16.15$; $p < .0001$) were the third lifetime period (>20 years) and executive function composite score; and finally (5) symptomatic attribution (13%; $F(2,60) = 4.61$; $p < .01$) were introspection and the third life period (>20 years).

3.2. Effects of three therapeutics groups: RECOS, REMAu and MBCT

3.2.1. Insight (Table 3)

ANOVAs on the five measures of insight (SUMD) showed a significant session effect but no group effect.

ANOVAs on symptomatic awareness and symptomatic attribution scores showed interaction between session and group. The post hoc results revealed that REMAu showed significant improvements in symptomatic awareness ($p < .05$) in comparison with other groups, while MBCT showed significant improvements in symptomatic attribution ($p < .001$) in comparison with other groups.

3.2.2. Basic cognitive assessments (Table 4)

The ANOVAs and post hoc results revealed a significant improvement on post evaluation for the Memory composite score ($p < .05$) regardless of the group. RECOS showed significant improvements in Executive functions ($p < .01$) in comparison with other groups. Change in the Attention composite score did not show a statistically significant difference between groups, or session.

Table 4

Results from the two-way or three-way ANOVAs on all basic cognitive, autobiographical, metacognitive, and subjective complaints measures.

| | Group effect F (<p) Gp | Session F (<p) | Group × Session F (<p) | Period × Group F (<p) | Session × Period F (<p) | Group × Session × Period F (<p) |
|---------------------------------|---------------------------|-------------------|---------------------------|--------------------------|----------------------------|------------------------------------|
| RECOS Rc (N=21) | | | | | | |
| REMAu Rm (N=20) | | | | | | |
| Mindfulness Md (N=22) | | | | | | |
| Basic cognitive functions | | | | | | |
| Attention & Processing Speed | n.s. | n.s. | n.s. | / | / | / |
| Memory | n.s. | 5.7 (*) | n.s. | / | / | / |
| Work. Mem. & Ex. Functions | n.s. | n.s. | 5.6 (**) | / | / | / |
| Autobiographical memory | 10.6 (***) Rm | 28.2 (***) | n.s. | 9.4 (***) | 3.0 (*) | n.s. |
| Episodic score | | | | | | |
| (1) 0–9 age, (2) 10–19 age, | | | | | | |
| (3) >20 age, (4) 12 last months | | | | | | |
| Meta-cognition | | | | | | |
| ToM Total score | n.s. | 28.6 (***) | 4.8 (*) | / | / | / |
| (Cognitive & Affective) | | | | / | / | / |
| Self Total score | n.s. | 28.4 (***) | 4.7 (*) | / | / | / |
| Identity | n.s. | 9.4 (**) | n.s. | / | / | / |
| Satisfaction | n.s. | 27.4 (***) | 3.1 (*) | / | / | / |
| Behavior | n.s. | 9.1 (**) | n.s. | / | / | / |
| Introspection | n.s. | n.s. | n.s. | / | / | / |
| Subjective Complaints | | | | | | |
| (SSTICS & CDS Total score) | n.s. | 30.1 (***) | 4.7 (*) | / | / | / |
| MAAS : Total score | 3.7 (*) Md | 12.8 (***) | 16.7 (***) | / | / | / |

Reference (see legend Table 2): F: the ANOVA F-statistic; *p*: p-value; n.s.: non-significant.

Significance: *p* < .05*; *p* < .01**; *p* < .001***.

3.2.3. Autobiographical memory assessments

The ANOVA revealed a significant group effect ($p < .001$), the post hoc test indicated that REMAu showed significant improvements, in comparison with the two other groups. The ANOVA also revealed two significant two-way interactions: 4(Period) \times 3(Group) ($p < .05$). Follow-up analysis indicated that the second lifetime period (10–19 years) was better recalled for REMAu in comparison with other groups, and that the first lifetime period (0–9 years), was less rich than the three other periods at the post evaluation, regardless of the group.

3.2.4. Metacognitive assessments

The ANOVA revealed that the MBCT showed a significant improvement in the total score of TOM (cognitive and affective) ($p < .001$) in comparison with other groups. Moreover, there was a significant difference between the three groups on the self-concept scale. The post hoc results revealed that the MBCT group showed significant improvements just in the satisfaction score ($p < .05$) and the total score ($p < .05$).

3.2.5. Subjective complaints assessments

The results revealed a significant two-way interaction group by session for the total score of SSTICS and CDS. The post hoc test indicated that RECOs showed significant improvements in perceived cognitive difficulties as manifested in activities of daily living in comparison with other groups. Regarding the total score of MAAS, the post hoc results revealed that MBCT showed significant improvements in comparison with the two other groups.

4. Discussion

This study aimed to better understand factors contributing to poor insight in patients with early-course schizophrenia and to test strategies to help patients develop their insight. We tested three sets of cognitive variables (basic, autobiographical and metacognitive models) potentially predictive of the level of insight into baseline assessment, and evaluated how gains of these variables via remediation therapy improved insight dimensions. The main findings suggest that poor insight was more strongly associated with deficits in episodic autobiographical memory and metacognition than with basic cognitive deficits. They indicated that prediction of poor insight was improved by adding autobiographical and metacognitive measures to standard basic cognitive assessments exploring attention, episodic memory and executive functions. Moreover, we found that the gains in cognitive, autobiographical memory and metacognitive skills via remediation therapy improved insight. More specially, by comparing the effect of three therapeutic interventions (RECOs, REMAu, MBCT) on measures of insight, we showed a variable benefit on the level and dimensions of insight depending on the therapeutic group. These results support the idea that

insight is better understood as consisting of several independent and overlapping components rather than being a unitary process [9]. After discussing the predictors of insight in schizophrenia, we discuss the specific effects of each kind of remediation therapy.

At baseline assessment, each isolate set of cognitive variables (basic, autobiographical and metacognitive models) predicted dimensions of poor insight. However, the deficits in basic or metacognitive skills slightly accounted for insight, predicting only one insight dimension (awareness of treatment benefit), whereas autobiographical memory predicted all dimensions, except the awareness of treatment benefit. Interestingly, when predictors from three domains were entered in a final model, the amount of accounted variance increased in all insight subscales (except the symptomatic attribution). Their respective enhancement via remediation therapy significantly improved dimensions of insight: enhancement of basic cognitive skills or autobiographical memory mainly accounted for improvements in only one dimension of insight, namely symptomatic awareness, while enhancement of metacognitive skills mainly accounted for improvements in symptomatic attribution. These findings showed for the first time that in addition to basic cognitive deficits, episodic autobiographical memory significantly influenced levels of symptomatic awareness, which substantiates the auto-noetic consciousness model of insight [21]. Besides, we confirmed that metacognition is an important mediator in addition to basic cognitive deficits of poor insight in schizophrenia [32,37], especially regarding symptomatic attribution.

Therefore, we found that prediction of insight deficit was improved by combining autobiographical memory, metacognitive and basic cognitive measures. Nevertheless, the improvement was significant only for one dimension of insight, namely symptomatic awareness. The improvement of the four other dimensions of insight was not significantly related to observed changes in the final computed model. To better understand these results, we explored the best predictor variables individually involved in the improvement of five insight dimensions.

The results indicated a significant involvement of two autobiographical lifetime periods (especially from >20 years and 12 last months) in the improvement of three dimensions of insight (awareness of mental illness, symptomatic awareness and symptomatic attribution). Interestingly, these findings emphasized the role of autobiographical recall from the recent period and the >20 years lifetime period in dimensions of insight. The former period is known to be essential for self-perception updating [28,29], and the latter period generally corresponds to the entry of mental illness in schizophrenia. The young adulthood in addition to the adolescence lifetime period [30] comprises autobiographical memories connected to a number of changes, affecting all areas of daily life and being related to illness. In healthy adults, the autobiographical memories of events encoded from 10 to 30 years are particularly well remembered (i.e.,

remembrance bump phenomenon) because they illustrate a critical period for the formation and maintenance of personal identity [67–69].

In addition to autobiographical memory, we found that basic episodic memory was involved in the awareness of mental illness improvement. In line with Wiffen et al. [70], our results provided a new understanding of the awareness of mental illness. On the one hand, they confirmed that memory function was necessary for intact insight, and on the other hand they added further findings on the relationship between autobiographical memory (especially from the last 12 months) and the level of awareness of mental illness. It is also worth noting that two other specific variables added to autobiographical memory contributed to the improvement of symptomatic awareness and symptomatic attribution. Introspective ability improved symptomatic attribution, while executive functioning improved symptomatic awareness. In line with Antonius et al. [38], we confirmed the link between symptomatic attribution, introspection abilities and memory process and the link between symptomatic awareness, executive functions and memory process, which may support their findings that insight is a multidimensional construct with multiple neural determinants.

The results also suggest that improving TOM skills can specifically improve two dimensions of insight (i.e., awareness of benefit of treatment and awareness of psychosocial consequences). Further detailed analysis stresses that awareness of treatment benefit was enhanced by gains in the cognitive component of TOM (and level of self-satisfaction), while awareness of psychosocial consequences was enhanced by gains in the affective components of TOM. This difference shows that the ability to make inferences about the beliefs and motivations of others [71] contributes to awareness of treatment benefit, while the ability to infer what another person is feeling by adopting the other person's point of view [71,72] contributes to awareness of psychosocial consequences. The present findings are in line with those of Langdon & Ward [31], where awareness of mental illness and the capacity to recognize symptoms as abnormal were strongly associated with cognitive TOM. More generally, they confirm the hypothesis that lack of insight in schizophrenia is well understood as an impairment of metacognition [32], but interestingly we add new data by pointing to the differential contribution of affective and cognitive TOM.

By comparing three kinds of remediation therapy, the results suggest that the RECOs program (cognitive remediation, [61–63]) significantly improves executive functioning and subjective complaints, and provides no significant effects on insight. The REMAu program (autobiographical reminiscence, [64]) improves the quality of autobiographical recall and symptomatic awareness (insight dimensions). Finally, the MBCT (mindfulness therapy, [65]) improves more the metacognitive abilities, such as theory of mind, mindful attention awareness and symptomatic attribution (insight dimensions).

Our results are consistent with those in the literature. A recent study of the program RECOs reported an improvement in overall cognitive functioning and did not lead to significant improvements in components of insight [73]. The REMAu showed significant increase in the quality of autobiographical recollection, in comparison with other groups. These results confirmed some previous findings in schizophrenia [74] indicating the effectiveness of autobiographical reminiscence on the recovery of specific events. However, they specified that the gradual reconstruction from the general facts to specific memories related to the self, recovering four various periods of life, might improve the ability to detect and interpret a set of strange phenomena, such as hallucinations or delusions. While the REMAu program seemed more profitable to detect and interpret the symptoms, the MBCT brought more acceptance and understanding of these symptoms, in order to attribute them to the mental illness. This may reflect the specificity of this program which requires individuals to become fully aware of their perceptual experiences, and to create a sense of balance and tolerance for one's conscious experience. More specifically, the MBCT showed significant enhancements in metacognitive functions and the level of symptomatic attribution in comparison with other treatments. This was in keeping with recent studies that found benefits of the mindfulness therapy on clinical symptoms in schizophrenia [75–77]. Therefore, the present findings suggest that the meditation practice (for recent review, [78]), applied to patients with schizophrenia (in order to increase the awareness of their perceptual experiences, the sense of balance and the tolerance for one's conscious experience), would be valuable to improve the symptomatic attribution.

In conclusion, the present results strengthen the multidimensional viewpoint of insight. They confirm that cognitive and metacognitive deficits are involved in poor insight, and extend previous findings showing that disorders of autobiographical memory associated with recall of specific personal events should be considered in the care of insight in schizophrenia. They highlight that the improvement of each dimension of insight depends on the gains of different domains covering basic cognitive functions, autobiographical memory and metacognition and that one kind of remediation therapy is not sufficient to improve all the dimensions of insight. Thus, we recommend that for a significant improvement of all dimensions of insight, a cognitive program should combine the following cognitive domains: processes of episodic memory, executive functioning, autobiographical memory, self-perception, and TOM. In this approach, the combination of the three kinds of therapy explored here (basic cognitive remediation, autobiographical reminiscence, and mindfulness) should be a valuable strategy. Further studies are needed to evaluate the effect of a multidimensional remediation therapy on improving insight. However, individual psychotherapy, focusing on the development of two components of self-experience — personal narrative and the capacity for

metacognition — could also contribute to a better self-awareness, awareness of others and the world around (for review, see [79]). In future research, it would be interesting to assess the effects of combining psychotherapy with multidimensional remediation (general cognitive, autobiographical memory, and metacognitive) on the level of insight, symptomatology and functional outcomes.

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