# Cognitive Remediation Therapy in a Patient at Ultra High Risk for Psychosis

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*Abstract:* **Cognitive dysfunctions are core symptoms in patients with Ultra High Risk (UHR) of psychosis and can impact social functioning. Non pharmacological treatments are recommended in these patients such as Cognitive Remediation Therapy (CRT). This therapy is still not widely used. Most studies about this topic were performed in western countries using computer based CRT. Our study details the cognitive assessment and management of an UHR patient from Tunisia using paper based CRT protocol. A better knowledge of cognitive impairment profile can help improve patients outcome. Cognitive symptoms interact with social and cultural environment. There is a need for studies from various countries that are under-represented in the scientific literature such as Arab Countries. This could help to depict cognitive profile of UHR patients. The paper and pencil based therapy can be performed in low and middle income countries and help widen the use of CRT worldwide.**

## I. BACKGROUND

Schizophrenia and related psychoses are severe mental illnesses with heavy life burden for patients, families and society (1). They also have high economic cost. Early detection and management of patients are key elements to improve outcome (2). Detection before disease onset is highly recommended at the stage of high risk mental state. Hence, all mental health professionals should try to screen for people at high risk for developing psychosis and offer them adequate follow up in order to prevent or delay transition to psychosis (3). Guidelines recommend to use non pharmacological treatments rather than antipsychotics since these persons are usually adolescents or young adults and they are not yet ill, it is a risk state (4,5). Usually, people with Ultra High Risk (UHR) of psychosis report symptoms such anxiety, depression or school dropout (6). Cognitive impairments are core features in UHR state and can predict psychotic transition (7). Main impairments were reported in visual and verbal memory (8), speed processing and problem solving (9). Cognitive dysfunctions have also an impact on clinical symptoms and social functioning (10). Clinical trials using cognitive remediation in UHR patients showed the efficacy of this therapy on cognition (11–14), functional outcome (14,15) and preventing transition to psychosis (16). Glenthøj et al made a randomized trial and found improvement in social cognition and neuro-cognition in UHR patients (8).

Studies on cognitive impairments in UHR are often performed in western countries. Nonetheless, cognition is tightly connected with cultural environment. There is an interaction between cognition and social functions and they can affect each other. Thus, more studies from eastern and Arab countries are necessary in order to depict the whole picture of cognitive profile in UHR patients. A better knowledge of these dysfunctions is crucial to better detect and manage these patients allover the world. Besides, most studies use computer based programs that are not widely prevalent in middle and low income countries.

### Objective of the study

The objective of this study was to detail the cognitive assessment, management and outcome in one patient with UHR state using paper and pencil based CRT protocol.

## II. METHOD

This is an intervention study using CRT in a patient with UHR state. It was performed in Mental Health Department of Mongi Slim Hospital in Marsa, Tunisia. This patient benefited from 30 sessions of CRT from March to November 2021. The CRT protocol used only paper and pencil based activities. All tests used are validated in Tunisia or culture free tests.

### Ethical considerations

The patient and his family gave their informed consent. Investigators respected confidentiality and protected personal data.

## III. CASE STUDY

### 3.1. General assessment

MJ is a 24 years old male. He finished high school education. He has no regular employment. He consulted on March 2021 at the mental health department for anxiety and attention deficit. Psychiatric interview also found feelings of depersonalization, ideas of reference and sleeping disturbances. He reported feeling unable to work because of cognitive impairment. UHR state was suspected. The Comprehensive Assessment of At Risk Mental States (CAARMS) validated in Tunisia was administered (17). This scale confirmed the at risk mental state and classified him in the group 2 (mild psychosis group).

### 3.2 Initial Cognitive Assessment

The patient underwent a cognitive assessment performed by a neuro-psychologist. The tests used at the first assessment are

detailed in Appendix1 and 2. This initial assessment found the following results:

Memory functions

Recall of biographical and old memories was satisfactory. Short-term retention of information appears to be efficient (verbal span = 7) with difficulties in manipulating information in working memory (reverse verbal span = 4).

At the level of episodic memory, the Tunisian Verbal Learning Test (TVLT) revealed good recall strategies for list 1 based on semantic grouping of words.

In the visual modality, the replication of the Complex Figure of Rey (CFR) revealed a weakening of visuo-spatial memory. This may be due to the wrong choice of construction from the beginning. Executive functions

The rapid frontal efficiency battery shows global satisfactory results with a slight inconsistency in the similarity sub-test assessing abstract reasoning. However, at the attention level, there was a weakening of attention resources with distractibility and emergence of involuntary thoughts during the interview. There was a deficit in sustained attention reflected in a large number of omissions and false alarms in the double barrage test.

The speed of processing visual information appears normal at the Trail Making Test (TMT). However, he made several hesitations and sometimes long trips, which may indicate impulsiveness. He also has a flexibility deficit manifested by a low score in the Wisconsin Sorting Cards Test (WSCT) assessing categorization and mobilizing flexibility. Indeed, in the WCST, MJ found difficulty in developing categories. He also had several perseverations and inefficient learning during the test. The measurement of mental planning through the CFR showed a deficit in the grapho-motor planning modality.

Instrumental functions

Direct observation shows that MJ has a good command of spontaneous language and good oral comprehension. He also has good visuo-constructive skills.

During the assessment, MJ manifested uncontrollable agitation and crying. We also noticed an inability to think clearly and fluctuations in alertness.

Global Functioning Assessment

There was a serious alteration of functioning on the Global Assessment of Functioning (GAF) scale (18) with a score of 45%. He felt unable to look for a job.

*3.3 Management and outcome*

MJ had 30 sessions of CRT with the neuro-psychologist. The CRT protocol used in this study was a paper-pencil remediation method administered in face-to-face encounters, which includes three modules: cognitive flexibility, memory and planning. The cognitive activities that were used during the therapy are summarized in Appendix 3. An ergo-therapist

worked in collaboration with the neuro-psychologist in order to help the patient improve his abilities in daily tasks. Cognitive remediation improves cognitive functions on theoretical exercises and ergo-therapy helps patients transfer these new abilities into social life. He also benefited from psychiatric follow up and support psychotherapy with a psychiatrist. He did not warrant antipsychotic drugs.

*3.4 Final Assessment*

The final cognitive assessment showed an overall moderate improvement in cognitive functions and more significant improvement in social life.

Table 1 compares the scores on cognitive tests before and after CRT.

M was able to complete the tests and was cooperative.

Short-term retention of information appears to be intact.

In a 15-word learning task (Tunisian Verbal Learning Test - TVLT), his performance indicated a good potential for learning strategies with a difficulty in consolidating information. The recognition task showed unsatisfactory results in detecting good targets, with some false alarms. This supports the hypothesis of a difficulty in consolidating information. There is an improvement in learning compared to the first assessment.

In terms of visual memory, the score of the restitution of the complex figure of Rey is satisfactory compared to the first assessment. Which reflect an improvement in visual-spatial planning abilities.

The FAB result attest a proper performance of the executive functions. However, the results of the second part of the TMT show an alteration in mental flexibility, which may be due to an impairment in attention. This was further confirmed in the barrage tests, it shows a decrease in attentional capacity compared to the first evaluation. It may be due to several external factors (such as sleep, stress, etc.).

At the social level, there were significant results on the quality of life and GAF score increased to 60%. He was able to get a stable job and his perception of the world has improved with goals aligned with the general context of society. Family was also satisfied by the outcome

## IV. DISCUSSION

This study offers a detailed description of the cognitive functions and management in one UHR patient. Management was performed through CRT protocol and involved collaboration between psychiatrist, neuro-psychologist and ergo-therapist. First assessment showed our patient had deficits in memory, flexibility, attention and planning. Processing Speed was considered normal. The final assessment showed a moderate improvement in most cognitive areas and a great improvement in social, occupational and family life. The literature reported different types of cognitive impairments in UHR patients that can affect

all domains (9,10). Liss Anda et al. compared cognitive profile in a group of patients with schizophrenia and a group of UHR patients (9). The latter group showed significant impairment in speed of processing, working memory, verbal learning, reasoning, and problem solving. There is still no confirmed cognitive profile in UHR patients and further studies are needed with patients from different countries and cultures. CRT is recommended in UHR patients (4). Nonetheless, it is still not widely used. A systematic review included only six clinical trials including few participants and methodological biases (7). The implementation of this therapy warrants much time and financial costs. Besides, a multi-disciplinary collaboration is usually necessary. For example, the collaboration of an ergo-therapist is crucial to improve patient abilities on daily tasks. Most literature studies are performed using computer based activities (7). All these

requirements can hamper the generalization of this therapy. CRT can be computer based or paper and pencil based. Our study uses only paper based activities and has shown to be effective. It relied mainly on human and time resources. It can be a model to follow in middle or low income countries and help widen the use of CRT allover the world, even in settings where computers are not easily available.

## V. CONCLUSION

We reported a detailed description of the cognitive assessment, management and outcome in an UHR patient treated with pencil-paper CRT protocol in Tunisia. This study showed improvement in cognitive and functional domains. Many studies in the literature confirmed these findings. More studies form different countries are necessary to better characterize cognitive profile in these patients.

Table 1. Comparison between patient tests scores before and after therapy

| | Tests | Scores pres CRT | Score post CRT | Commentary |
|---|---|---|---|---|
| **Executive functions** | <u>FAB :</u> score /18 | 16 | 17 | |
| | **Attention** | | | |
| | <u>Barrage of a symbol :</u><br>Number of patterns processed :<br>Number of omissions:<br>Execution time: | 36 (97%*)<br>1<br>89s | 37 (100%*)<br>0<br>125s | *Response rate |
| | <u>Double barrage :</u><br>Number of patterns processed :<br>Number of omissions:<br>Execution time: | 59 (75%*)<br>19<br>195s | 65 (83%*)<br>13<br>247s | *Response rate |
| | **Flexibility** | | | |
| | <u>TMT-A</u><br>Execution time:<br><u>TMT-B</u><br>Execution time: | 51s<br><br>129s | 73s<br><br>244s | Several hesitations<br>Auto-correction |
| | **Visual-constructive skills**<br><u>Figure of Rey:</u> score/72 | Copy= 68<br>Reproduction=37 | Copy= 72<br>Reproduction=50 | |
| **Memory skills** | **Episodic memory**<br><u>TVLT</u><br>Immediate recall:<br>List1<br>Free recall 1 :<br>Free Recall 2 :<br>List 2<br>Free recall 1<br>Free Reminders 2<br>Free recall list 1 :<br>Indexed recall list 1 :<br>Deferred recall list 1 :<br>Indexed recall list 1 :<br>Recognition : /15<br>Distractors : /30<br><br><u>Working memory</u><br>Direct span<br>Indirect span | 7<br><br>5<br>5<br><br>3<br><br>*<br>*<br>*<br>*<br>*<br>*<br><br><br>7<br>4 | 8<br><br>6<br>7<br><br>4<br>4<br>4<br>4<br>3<br>4<br>7<br>3<br><br><br>5<br>4 | *Refused to continue the test after the presentation of the B list |

CRT: Cognitive Remediation Therapy; FAB: Frontal Assessment Battery; TMT: Trail-Making Test; TVLT: *Tunisian Verbal Learning Test*

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APPENDIX 1

Tests used in first cognitive assessment

| Cognitive function | | Tests |
|---|---|---|
| Memory functions | Working memory | ● Digit span task<br>● Digit span forward task |
| | Episodic memory | ● Tunisian Verbal Learning Test<br>● Interview |
| Executive functions | For general assessment | ● Frontal Assessment Battery (FAB) |
| | Attention | ● Barrage Test one target<br>● Barrage test Double Target |
| | Flexibility and speed of processing | ● TMT (Trail Making Test) |
| | Categorization | ● WSCT (Wisconsin Card Sorting Test) |
| | Planning strategy | ● FCR (Rey Complex Figure) |
| Instrumental functions | Spontaneous language & oral comprehension | ● Direct observation |
| | Visual-constructive skill | ● FCR (Rey Complex Figure) |

APPENDIX 2

**Description of the main tests used in the study**

***Frontal Assessment Battery (FAB)*** or the BREF (Batterie rapide d'efficience frontale). A measure that allows an overall assessment of executive functions. BREF is composed of 6 subtests (2 cognitive and 4 behavioral) exploring conceptualization, mental flexibility, motor programming, sensitivity to interference, inhibitory control and autonomy from the environment (Ben Jemaa & Bellaj , 2008).

***Digit span task*** is a simple measure of working memory capacity, the cognitive ability to store and manage information on a transient basis

***TVLT (Tunisian Verbal Learning Test)*** is a measure of verbal learning and memory deficits in older adolescents and adults

***TMT (Trail Making Test)*** is a test of visual attention and task switching. It provides information about speed of processing and mental flexibility.

***Barrage Test*** is used to assess sustained and selective attention

***WSCT (Wisconsin Card Sorting Test)*** is used to "assess abstract reasoning ability and the ability to shift cognitive strategies in response to changing environ-mental contingencies" (Kohli & Kaur, 2006).

***FCR (Rey Complex Figure)*** is used to assess the visuo-constructional ability and visual memory.

APPENDIX 3

Summary of all the activities used in Cognitive Remediation Therapy

| *Flexibility* | *Memory* | *Planning* |
|---|---|---|
| <ul><li>Line bisection</li><li>Superimposed figures</li><li>stroop like</li><li>manipulation of shape, numbers and letters</li><li>number change</li><li>sorting exercise</li><li>manual exercises</li></ul> | <ul><li>multiple visual search</li><li>copy symbols</li><li>delayed responses</li><li>sequential search</li><li>visual analysis</li><li>conceptual manipulations</li><li>consecutive number search</li><li>delayed responses</li><li>multiple visual search</li><li>sequencing of numbers</li><li>double counting</li></ul> | <ul><li>shared attention</li><li>serial search</li><li>sequencing</li><li>building cubes</li><li>category symbol copies</li><li>verbal analogies</li><li>verbal association</li><li>visual search</li><li>dual task</li><li>chronological ordering</li></ul> |