

COGNITIVE DEFICITS, COGNITIVE RESERVE AND PSYCHIATRIC REHABILITATION IN PSYCHIATRIC OFFENDERS: A STUDY ON A SAMPLE OF PATIENTS INCLUDED IN REHABILITATION PROGRAMS

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SUMMARY

Background: This study explores the relationship between cognitive deficits, cognitive reserve (CR), and rehabilitation outcomes in psychiatric offenders and non-offenders. The objective is to analyze how neurocognitive functioning, impulsivity, and CR influence the duration and effectiveness of psychiatric rehabilitation.

Methods: Fifty-five patients from rehabilitation centers in Southern Italy were assessed using standardized psychiatric and neuropsychological scales. Participants were divided into offenders (n=19) and non-offenders (n=36). Assessments included BPRS, BIS-11, CRIq, T.I.B., and TMT A/B. Statistical analyses involved Pearson’s correlation and t-tests using JASP.

Results: Significant correlations were observed between months of rehabilitation (MoR) and TIQ in non-offenders and CRIq in offenders. A significant correlation between MoR and TMT was observed only in offenders. Offenders with more than 24 months of rehabilitation showed lower impulsivity scores (BIS-11). These findings indicate distinct rehabilitative trajectories and neurocognitive responses in the two groups.

Conclusion: Cognitive reserve and neurocognitive assessment can inform individualized rehabilitation strategies in forensic psychiatric populations. Offenders may particularly benefit from longer and more targeted interventions to mitigate impulsivity and enhance cognitive functioning.

Key words: cognitive reserve - psychiatric rehabilitation - forensic psychiatry – impulsivity - neurocognitive assessment

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INTRODUCTION

Cognitive deficits (CD), including memory, attention, and executive functioning deficits, are frequently observed in individuals with severe mental illnesses (Bertolino et al. 2012; Vacca 2022). These impairments affect engagement in psychiatric rehabilitation and compromise treatment adherence (Franza et al. 2018; Rampino et al. 2013). Cognitive Reserve (CR) reflects the brain’s resilience to neuropathological damage and is influenced by education, occupation, and intellectual engagement (Stern 2002). In psychiatric populations, higher CR has been linked to better outcomes. This study focuses on the relationship between CR, cognitive performance, and months of rehabilitation among offenders and non-offenders in psychiatric settings (Anaya et al. 2016; De Marco & Venneri 2017).

Different cognitive deficit between Offender and Non-Offender psychiatric patients

Research in psychiatric populations often distinguishes between offender and non-offender patients due

to the different psychosocial and clinical profiles these groups typically exhibit. Offender patients, those with a history of criminal behavior, often present with more severe psychopathology, including higher rates of antisocial personality disorder, substance use disorders, and more pronounced cognitive deficits. These differences could be related to factors such as earlier onset of mental illness, higher levels of stress and trauma, and different life experiences compared to non-offender patients.

Offender patients are more likely to exhibit significant deficits in executive functioning, impulse control, and decision-making abilities, which are cognitive domains closely linked to antisocial behavior and recidivism. These deficits can complicate the rehabilitation process, making it more challenging to achieve successful outcomes. There is evidence to suggest that offender patients may have lower cognitive reserve than non-offender patients, potentially due to lower levels of educational attainment, less stable employment histories, and less engagement in cognitively stimulating activities. This lower cognitive reserve

may exacerbate the impact of neurocognitive disorders, leading to poorer outcomes in psychiatric rehabilitation (Dima et al. 2024).

In Italy, Judicial Psychiatric Hospitals (OPG) were officially closed in 2016. The closure process was initiated by March 31, 2015. The law was part of a broader reform aimed at shifting from a custodial model to a system that provided more humane care for individuals with mental illnesses who had committed crimes. These individuals were gradually transferred to specific rehabilitation communities; they were also integrated with the other patients into Psychiatric Rehabilitation Communities. This shift raised concerns about the adequacy of existing rehabilitation programs to address the needs of these individuals, particularly regarding their cognitive reserve and neurocognitive functioning (Fioritti et al. 2001).

METHOD

Aim

This study aims to investigate cognitive reserve and neurocognitive functioning in a sample of patients placed in psychiatric rehabilitation communities, comparing offenders and non-offenders in terms of their cognitive profiles, psychopathological symptoms and months of psychiatric rehabilitation intervention. The findings will contribute to understanding the role of cognitive reserve in psychiatric rehabilitation and inform the development of more effective, individualized treatment strategies.

Participants

Fifty-five patients were evaluated in residential psychiatric rehabilitation centers in Southern Italy.

All patients participated in a psychiatric rehabilitation program involving cognitive remediation and psychoeducational interventions.

The patient sample was divided into offenders and non-offenders.

For each patient, personal data, diagnosis and months used for the psychiatric rehabilitation intervention were collected.

Assessments

All patients were administered the following rating scales:

- *Brief Psychiatric Rating Scale (BPRS) (Overall & Gorham 1962)*: for assessment of psychopathology.
- *Cognitive Reserve Index Questionnaire (CRIq) (Nucci et al. 2012)*: an instrument for measuring cognitive reserve.

- *Estimated TIQ (T.I.B.) (Sartori et al. 1997)*: Provides an estimate of premorbid intelligence, based on general intelligence and reading ability.
- *Trail Making Test (TMT), parts A and B (Llinàs-Reglà et al. 2017)*: assesses visual attention, motor speed, mental flexibility, and executive functions.
- *Barratt Impulsiveness Scale (BIS-11)*: to measure the general level of impulsivity and its different aspects.

Statistical Analysis

Statistical data were analyzed using JASP (University of Amsterdam). Validity and reliability analyses were conducted with exploratory and confirmatory factor analysis. Pearson's correlation was used to assess relationships between variables (MoR, TIQ, CRIq, TMT). Independent samples t-tests were performed where applicable.

We used Pearson's correlation coefficient (for normally distributed data) to measure the relationship between the two variables.

To compare the months of rehabilitation between offenders and non-offenders, we used an independent samples t-test if the data follow a normal distribution.

RESULTS

Demographic and Clinical Characteristics

The mean age (years) \pm SD was 45.01 ± 10.18 (females: 45.45 ± 7.86 ; males: 47.77 ± 11.41). Patients presented with various psychiatric disorders, diagnosed according to DSM-5-TR criteria: Mood disorders ($n = 18$), Personality disorders (antisocial and borderline, $n = 14$), Psychotic spectrum disorders ($n = 11$), Schizophrenia ($n = 11$), and Other disorders ($n = 1$).

The patient sample was divided into offenders ($n = 19$; 10.53% female, 89.34% male) and non-offenders ($n = 36$; 50.00% female and male).

Months of rehabilitation (MoR) vs TIQ correlation

The tables 1-4 show the results of the administered scales.

- Positive correlation between mean total Months of Rehabilitation (MoR) score vs. TIQ in the two samples analyzed (Table 1);
- No correlation between mean total MoR score vs. TIQ in the two samples analyzed in Offenders (Table 2);
- Positive correlation between mean total MoR score vs. TIQ in the two samples analyzed in Non-Offenders (Table 3);
- A positive correlation between averages in the IQ was highlighted, especially in offenders, although not statistically significant (Table 4).

Table 1. MoR – TIQ (Offend + Non-Offend) Pearson's Correlations

	Pearson's r	p	Covariance
MoR - TIQ	-0.352**	0.008	-190.147

* p < 0.05; ** p < 0.01; *** p < 0.001

Table 2. MoR – TIQ (offenders) Pearson's Correlations

	Pearson's r	p	Covariance
MoR - TIQ	-0.425	0.070	-181.088

* p < 0.05; ** p < 0.01; *** p < 0.001

Table 3. MoR – TIQ (Non – Offenders) Pearson's Correlations

	Pearson's r	p	Covariance
MoR - TIQ	-0.336*	0.045	-199.328

* p < 0.05; ** p < 0.01; *** p < 0.001

Table 4. MoR – TIQ Independent Samples T-Test

	t	df	p	Mean Difference	SE Difference
TIQ_O	1.098	17	0.287	10.851	9.879
TIQ_NO	0.527	17	0.605	4.943	9.372

Note: Student's t-test

Months of rehabilitation (MoR) vs CRIq correlation

The tables 5-6 show the results of the administered scales.

- Positive correlation between MoR and CRIq in offenders (Table 5);
- No positive correlation between MoR and CRIq in non-offenders (Table 6).

Table 5. MoR – CRIq (Offenders) Pearson's Correlations

	Pearson's r	p	Covariance
MoR - CRIq	-0.355	0.035*	-1012.981

* p < 0.05; ** p < 0.01; *** p < 0.001

Table 6. MoR – CRIq (non- offenders) Pearson's Correlations

	Pearson's r	p	Covariance
MoR - CRIq	0.169	0.324	216.781

* p < 0.05; ** p < 0.01; *** p < 0.001

Cognitive Reserve

Offenders had a mean CRIq score of 88.93, significantly lower than non-offenders, who had a mean score of 126.77 (p < 0.05). The distribution of cognitive reserve levels also differed, with 25% of offenders classified as having low cognitive reserve, 20.83% as medium-high, and 33.33% as high. In contrast, 31.43% of non-offenders had low cognitive reserve, 28.56% had medium-high, and only 2.86% had high cognitive reserve (Table 7).

Table 7. MoR – CRIq Independent Samples T-Test

	t	df	p	Mean Difference	SE Difference
CRIq_O	-0.119	17	0.907	-8.118	68.293
CRIq_NO	1.364	17	0.190	27.265	19.991

Note: Student's t-test

Months of rehabilitation (MoR) correlation vs CRIq

The tables 8-9 show the results of the administered scales.

- No correlation between months of rehabilitation and mean TMA and TMB scores (Table 8);
- Statistically significant correlation between MoR and TM in Offenders (Table 9).

Table 8. MoR vs TM A – TM B (non offenders) Pearson's Partial Correlations

	Pearson's r	p	Covariance
TM A - TM B	0.183	0.293	10.857

Note: Conditioned on variables: MoR.

* p < 0.05; ** p < 0.01; *** p < 0.001

Table 9. MoR vs TM A – TM B (offenders) Pearson's Partial Correlations

	Pearson's r	p	Covariance
TM A - TM B	0.606**	0.008	2182.526

Note. Conditioned on variables: MoR.* p < 0.05;

** p < 0.01; *** p < 0.001

Months of rehabilitation (MoR) vs BIS-11

Offenders who underwent longer rehabilitation programs (>24 months) exhibited a significant decrease in their mean BIS-11 scores (Table 10).

No statistically significant changes in BIS-11 scores were observed with respect to rehabilitation duration in total patients.

Table 10. MoR vs – BIS-11 (offenders e non offenders)

	1-6 months	7-24 months	>24 months
Offenders			
Mean	61.83	68.67	58.50
SD	15.69	13.28	8.76
No-offenders			
Mean	53.43	5.18	65.33
SD	12.07	17.05	15.20
Total			
Mean	57.83	63.77	63.53
SD	14.43	16.07	13.59

Psychopathology

The BPRS scores indicated that offenders had significantly lower psychopathological symptom severity (mean score: 41.50) compared to non-offenders

(mean score: 53.92, $p < 0.05$). Females among the offenders had notably higher BPRS scores (mean score: 59.5) than their male counterparts (mean score: 39.86).

DISCUSSION

The findings suggest that cognitive reserve and IQ have distinct roles in rehabilitation outcomes. Non-offenders showed a stronger relationship between extended rehabilitation and improved IQ scores, while offenders showed greater improvement in CRIq scores. The positive relationship between MoR and TMT in offenders may reflect increased cognitive control with longer care.

Interestingly, extended rehabilitation reduced impulsivity (BIS-11) only in offenders. This supports the potential benefit of longer-term programs tailored to forensic patients. These insights advocate for individualized strategies in psychiatric rehabilitation that account for cognitive reserve and impulsivity traits.

CONCLUSIONS

This study investigated the relationship between the duration of months of rehabilitation (MoR) and various psychological assessments (TIQ, cognitive remediation, TM, and impulsivity) in two groups of psychiatric patients. The study analysed the psychiatric inpatients, both Offenders and Non-Offenders, housed in psychiatric rehabilitation centers.

While no statistically significant differences were observed between the two groups in terms of age, gender, and education, the correlational analyses revealed distinct patterns in the relationships between MoR and the assessment scales, suggesting differential impacts of rehabilitation on these groups (Rojas-Chambilla et al. 2024).

Among the most interesting results obtained, we observed a positive correlation between MoR and TIQ scores when the two groups were combined. However, upon separate analysis, this correlation remained significant only within the Non-Offender group, suggesting that more extended rehabilitation periods may be associated with improved TIQ scores, specifically in this population.

Another interesting aspect is the positive correlation between MoR and CRIq, which is exclusive to the Offender group. In this group, the total mean number of months of psychiatric rehabilitation was slightly higher, while the BPRS scores were lower, associated with psychiatric pathologies, with reduced cognitive worsening. These data suggest that extended rehabilitation may be associated with changes in CRIq scores in Offenders.

Our study also analysed the correlation between MoR and TM scores. Only in the Offender groups did we observe a significant correlation between MoR and TM scores. The psychiatric rehabilitation intensity might influence TM mean scores in Offenders, potentially reflecting changes in their perception or processing of threat.

While no overall statistically significant changes were observed in the BIS-11 scores relative to rehabilitation duration, a noteworthy exception was identified within the offender group. Offenders who underwent longer rehabilitation programs (>24 months) exhibited a significant decrease in their mean BIS-11 scores. Extended rehabilitation may contribute to a reduction in impulsivity among offenders.

The results of our study underscore the importance of evaluating various factors that influence individual psychiatric rehabilitation projects. Rehabilitation programs must consider the time required for intervention and the results obtained using the different assessment scales employed. The different correlations observed in our study underscore the need to implement individualized rehabilitation strategies that address the unique needs and characteristics of both offender and non-offender populations.

The observations made confirm the need to explore the mechanisms underlying the observed correlations and to investigate these data in other patient populations and other contexts. We emphasize the importance of developing rehabilitation programs that identify specific factors, such as those identified in our study, which can influence the duration of rehabilitation in offenders compared to non-offenders. Our data are preliminary results from a larger study also examining the influence of these factors on the treatment of these patients.

By further clarifying the tonalities of the correlations between the duration of rehabilitation and the results obtained on psychological distress, we can optimize rehabilitation interventions and improve the results for people undergoing psychiatric rehabilitation.

Contribution of individual authors:

Antonella Vacca: design of study, literature research, interpretation of data, manuscript writing.

Maria Vincenza Minò & Antonella Litta: manuscript writing.

Roberto Longo: supervision and final reading.

Mario Vetrano, Giovanna Lucisani, Barbara Solomita & Debora Benazzi: design of the study, data acquisition.

Andreana Franza: translation.

Francesco Franza: analysis and interpretation data.

All authors approved the final manuscript.

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