# Effectiveness of cognitive remediation for female inmates: a pilot study

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There is considerable evidence that neurocognitive deficits are frequent among incarcerated offenders. However, current correctional programming does not directly seek to remediate deficits in offenders' neurocognitive deficits. In this pilot project, we sought to treat neurocognitive deficits in incarcerated Portuguese adult women offenders ($n$ = 28) using cognitive remediation to target cognitive flexibility, memory, and planning. Statistically significant positive changes, with medium to large effect sizes, were discovered across several neurocognitive domains, including attention, speed of processing, verbal learning and memory, cognitive flexibility, and planning. We also found a decrease in the negative emotional states of depression, anxiety, tension/stress, and on disturbed behavior in prison. Cognitive remediation has the potential to enhance the neurocognitive functioning of incarcerated women. Controlled research is needed to establish cognitive remediation fully as an intervention for the treatment of neurocognitive deficits of incarcerated women.

**Keywords:** incarcerated female offenders; neurocognition; cognitive remediation; rehabilitation; executive functions

## Introduction

It has been demonstrated that criminality, antisocial behavior, aggression, and violence are associated with neurocognitive deficits and with reduced functional brain capacity. Particularly, the presence of executive functioning impairments is supposed believed to exert a considerable effect in the development of antisocial behavior, by decreasing impulse inhibition, sensitivity to reward and punishment, and the ability to plan and formulate behaviors in accordance with social demands (Ishikawa & Raine, 2003; Raine, 2002; Séguin, 2004). We refer to executive functions as a collection of top-down mental processes necessary for overcoming automatic and proponent

tendencies, which comprise core processes (inhibition, working memory, and cognitive flexibility) and higher functions (e.g. reasoning, problem solving, and planning) (see Diamond, 2013, for a review).

In two meta-analyses (Morgan & Lilienfeld, 2000; Ogilvie, Stewart, Chan, & Shum, 2011) it was demonstrated that individuals characterized by antisocial behaviors (e.g. violence, aggression) perform significantly worse on measures of executive functioning than do individuals who are not characterized by these same tendencies. In addition, return inmates (i.e. repeat offenders) are characterized by more severe and pervasive patterns of executive dysfunction than are first time offenders or controls (Ross & Hoaken, 2011). Both violent and non-violent offenders are affected by neurocognitive deficits (Hoaken, Allaby, & Earle, 2007), although the extent to which an offender displays executive dysfunction has been shown to predict both frequency and severity of violent crime (Hancock, Tapscott, & Hoaken, 2010).

In addition, among inmates, the prevalence of acquired traumatic brain injury is higher than in general population. Recent traumatic brain injury episodes in inmates are associated with more anger and aggression, and diminished cognitive functioning (Slaughter, Fann, & Ehde, 2003). Recently, it was reported that female inmates who suffered from traumatic brain injury exhibited a greater tendency toward violent behavioral infractions relative to female inmates with no diagnosed form of brain injury (Shiroma, Ferguson, & Pickelsimer, 2012). Also, research has reported the prevalence of abnormal pre-frontal activity and structure in offenders, which suggests that changes in the brain may contribute to aggression, violence, and unlawful behavior (Yang & Raine, 2009). Of course, not all individuals with brain abnormalities or neurocognitive dysfunctions engage in unlawful activities. We are entirely against any straightforward interpretation of crime, given that criminal behavior is heterogeneous and determined by a complex interplay of biological and social factors. However, a number of studies have been suggestive of the possibility that neurocognitive deficits in general, and executive functioning impairment in particular, may play an important role in the genesis and maintenance of offensive and criminal behavior (Giancola, 2004; Herrero, Escorial, & Colom, 2010; Hoaken, Shaughnessy, & Pihl, 2003; Marsh & Martinovich, 2006; Raaijmakers et al., 2008; Séguin, Nagin, Assaad, & Tremblay, 2004; Séguin, Pihl, Harden, Tremblay, & Boulerice, 1995; Villemarette-Pittman, Stanford, & Greve, 2002).

Offenders in prisons, especially female inmates, also display elevated emotional distress, as revealed by increased prevalence rates of anxiety and depression disorders (Allnutt, Wedgwood, Wilhelm, & Butler, 2008; Keaveny & Zauszniewski, 1999; Kjelsberg et al., 2006; Maden, Swinton, & Gunn, 1994). Moreover, prisoners present high amounts of psychological disturbance and adjustment problems that manifests in disturbed behavior, including violence, aggression, disobedience, tension, avoidance of contact with others, fear, lack of energy, learning difficulties, among many others

(Coid, 1984; Cooke, 1998). Although disturbed behavior has multiple etiologies (Gadon, Johnstone, & Cooke, 2006; Schenk & Fremouw, 2012), cognitive deficits certainly play an important role. In fact, cognitive impairments, especially in executive functions, disturb the ability to focus attention, to plan, to reason, and to exert self-control over strong predispositions, which will significantly affect the way one behaves, feels, and inhibit impulsiveness (Heatherton & Wagner, 2011; Hofmann, Baumeister, Förster, & Vohs, 2012; Vaughn, DeLisi, Beaver, Wright, & Howard, 2007).

Current correctional programs are based on cognitive-behavioral methods, and focus on improving impulse and anger control, values and moral reasoning, interpersonal skills and taking the viewpoint of others, and on identifying and compensating for distortions and errors in thinking. These methods have produced positive outcomes, reflected in lower recidivism rates and decreasing antisocial behavior (Brunton & Hartley, 2013; Doyle et al., 2013; Landenberger & Lipsey, 2005). However, there is evidence that neurocognitive deficits are not being addressed appropriately by most correctional rehabilitation programs (Ross, 2012). Based on the evidence that neurocognitive functioning is associated with aggression, violence, and recidivism, it is possible that improving neurocognition in general, and executive functioning in particular, could benefit inmates. That is, if we could help inmates with executive capacities such as strategy formulation, the inhibition of unsuitable inclinations, or set-shifting, not only may they be able to use those skills upon reintegration, but they may also be able to better take advantage of the existing correctional remediation programs (Ross & Hoaken, 2010).

Given the lack of specific literature regarding cognitive remediation, we can look to findings obtained from studies of neuropsychiatric disorders. Of particular interest are the findings regarding schizophrenia, which is associated with neurocognitive deficits similar to those displayed by offenders (Heinrichs & Zakzanis, 1998). For this disorder, it has been shown that cognitive remediation has the potential to produce durable improvements in cognition and functioning, that is maintained after controlling for non-specific effects (Wykes, Huddy, Cellard, McGurk, & Czobor, 2011). There is also evidence that specific rehabilitation that target cognitive impairments of schizophrenia can optimize patients' response to psychosocial rehabilitation (Spaulding, Reed, Sullivan, Richardson, & Weiler, 1999). Thus, it is conceivable that the same effect should occur if we expose inmates in prisons to cognitive remediation.

The aim of this study was to investigate whether a cognitive remediation program designed to address three cognitive domains (cognitive flexibility, memory, and planning) results in improvements on neurocognitive functioning, emotional state, and prison adjustment and behavior. To the best of our knowledge, this is the first study analyzing cognitive remediation for inmates in the context of a prison.

## Method

### *Participants*

Participants were recruited from the Special Prison Facility Santa Cruz do Bispo, a prison for women in the north of Portugal. Inclusion criteria for this study were as follow: (a) adequate Portuguese proficiency; (b) knowing how to read and write; (c) no diagnosis of a severe mental illness; and (d) no drug dependence. A total of 47 female inmates were invited to participate in the cognitive remediation program based on the inclusion criteria. Of those invited and before the study commenced, four refused to participate due to lack of interest and eight due to schedule conflicts. Thus, 35 inmates completed pre-intervention assessments and started the cognitive remediation program. Of these, two were released to the community and five refused to participate in the cognitive remediation sessions immediately after the beginning of the program.

The final sample consisted of 28 female inmates aged between 21 and 62 years old ($M = 35.82$; $SD = 8.86$). The majority of the participants were imprisoned for the first time. Six were convicted or indicted for more than one crime (three committed two crimes and three committed three crimes) and four were in remand detention waiting for a definite sentence. Regarding ethic procedures, all inmates agreed to participate in the study and provided written informed consent. The study was approved by the Portuguese Directorate General of Prison Services (Table 1).

### *Instruments*

Neurocognitive assessments were conducted with each participant before and after the intervention. These included the Trail Making Test (TMT) Part A & B (Reitan, 1992; Reitan & Wolfson, 1995), the Hopkins Verbal Learning Test – Revised (HVLT-R) (Benedict, Schretlen, Groninger, & Brandt, 1998), the Neuropsychological Assessment Battery-Mazes Test (NAB-Mazes, included in the *MATRICS Consensus Cognitive Battery;* (Nuechterlein & Green, 2006), the Letter Number Sequence (LNS) (Wechsler, 2008), the d2 Cancelation Test (Brickenkamp & Zillmer, 2007), the Rule Shift Cards Test (RSC) and Modified Six Elements (MSE), both from the Behavioral Assessment Dysexecutive Syndrome (Wilson, Alderman, Burgess, Emslie, & Evans, 1996).

For the HVLT-R, we computed the following scores: Total Recall (TR; sum of the three immediate recall trials), Delayed Recall (DR; total words recalled at the delayed recall trial), and Recognition Discrimination Index (RDI; true positives minus false positives in the recognition trial). For the d2 Cancelation Test, the scores analyzed were Total Test Effectiveness (TTE = total number of items processed minus error scores) and Concentration Performance (CP = number of correctly crossed out items minus errors of commission). In all assessments, higher scores reflected better neurocognitive

Table 1. Summary of participant characteristics.

| | *N* (%) or *M* (SD) |
|---|---|
| *Marital status* | |
| Married | 12 (42.86%) |
| Single | 5 (17.86%) |
| Divorced/separated | 9 (32.14%) |
| Deceased spouse | 2 (7.14%) |
| *Educational level (years)* | 8.21 (2.81) |
| *Crime*[a] | |
| Child sexual abuse | 2 (7.14%) |
| Aggression | 1 (3.57%) |
| Swindling and fraud/embezzlement | 2 (7.14%) |
| Coercion | 1 (3.57%) |
| Possession of firearms | 3 (10.71%) |
| Murder | 1 (3.57%) |
| Child pornography | 1 (3.57%) |
| Theft/robbery/aggravated burglary | 8 (28.57%) |
| Drug trafficking | 17 (60.71%) |
| *Penal situation* | |
| Remand detention | 2 (7.14%) |
| Convicted | 26 (92.86%) |
| *Prior incarcerations* | |
| No | 21 (75.00%) |
| Yes | 7 (25.00%) |
| *Sentence length*[b] (*months*) | 71.27 (40.05) |
| *Punishments*[c] | 0.79 (2.18) |

[a]The sum of the types of crimes is 37 because six participants committed more than one crime.
[b]Means for inmates already sentenced ($n = 26$).
[c]Punishments refer to the number of times the inmate was punished for incorrect behavior and/or breach of the Prison Rules.

functioning, with the exception of the TMT, in which a shorter completion time was indicative of better neurocognitive functioning.

In addition to these neurocognitive assessments, ratings of psychological distress (The Depression Anxiety Stress Scales – 21 item; DASS; Antony, Bieling, Cox, Enns, & Swinson, 1998; Lovibond & Lovibond, 1995) and prison adjustment (Prison Adjustment Questionnaire; PAQ; Wright, 1985) were obtained from the inmates. Ratings of prison behavior (Prison Behavioral Rating Scale; PBRS; Cooke, 1998) were obtained from correctional staff.

The DASS is a 21 item self-report questionnaire which has been widely used to assess symptoms of depression, anxiety, and stress. These 21 items are distributed in three scales with seven items each, that comprises a statement and four short response options to reflect severity and scored from 0 (*Did not apply to me at all*) to 3 (*Applied to me very much, or most of the time*).

The PAQ is a two-part questionnaire composed of 30 items addressing common adjustment problems inmates may experience during incarceration. In

this study, we used the first segment (20 items) designed to assess adjustment in prison compared with adjustment in the community. Inmates are asked to compare how they are doing in prison with how they functioned before prison. If their adjustment is worse while in prison, then they are asked to indicate the severity or frequency of the problem. Following prior research in female prison populations (Warren, Hurt, Loper, & Chauhan, 2004), we computed a distress and a conflict score.

The PBRS is a 36 item measure designed to assess psychological features and disturbed behavior in prison settings. The behaviors depicted in the scale were rated by the correctional staff using a 4-point rating scale (0 – never/rarely; 1 – sometimes; 2 – often; and 3 – most of the time). The items are divided into three subscales: Anti-authority, which reflects hostile behavior, tendency to break rules, aggression toward staff, and a lack of concern for others; Anxious–Depressed, which reflects tension, emotional volatility, fear, victimization, and worry; and Dull–Confused, which reflects lack of energy, mental slowness, and lack of awareness of the surrounding environment.

Higher scores on these three scales represent, respectively, higher negative emotional states of depression, anxiety, and tension/stress (DASS); greater levels of adjustment problems (PAQ); and more disturbed behaviors (PBRS).

### *Cognitive remediation*

The cognitive remediation training was based on a manual-based program consisting of 40 sessions delivered individually (Delahunty, Reeder, Wykes, Morice, & Newton, 2002; Reeder, Newton, Frangou, & Wykes, 2004; Wykes & Reeder, 2005). Each session is comprised of paper-and-pencil tasks that can be adjusted to the level of the individual, and that gradually increase in difficulty as the training progresses. The training targets components of three main cognitive domains: cognitive flexibility (engagement, disengagement and re-engagement with one cognitive set; switching between cognitive sets; and maintenance of one cognitive set), memory (maintenance of at least two information sets simultaneously; mentally transformation of held information; and training of specific mnemonic strategies), and planning (holding and mental transformation of an increasing number of information sets; organizing information and sequencing steps to achieve a goal).

During training, the therapist acts as a strategy coach. Information processing strategies are explicitly taught, self-monitoring is implemented (e.g. verbalization of task instructions), and techniques to organize behavior are incorporated into the tasks. Although hard to implement due to restricted functional opportunities in the prison context, the participants were encouraged to reflect on how the new strategies learned could be used in real-life situations, in order to promote transfer or generalization of cognitive skills into to daily life situations. To facilitate transfer, after each exercise or exercises set, we asked questions about the task (e.g. was the task easy or difficult?; did

you enjoy the task?), about the strategies used (e.g. what strategies/tricks did you use?; could you complete the task in a different way?), and about opportunities for transference (e.g. in what situation you might use the same strategy/ trick in your everyday life?).

For example, one task in the memory module was a task of multiple visual search. In this task, participants were asked to extract visually groups of two or three target letters from a larger group of letters. To improve performance on this type of task, there are several strategies that can be taught to participants. For instance, participants can repeat the target letters to themselves, or they can cover elements of the presented stimuli to avoid information overload. The cognitive strategies rehearsed in a task like this can be used successfully in situations where it is necessary to remember a series of instructions.

An errorless learning environment was provided, as the therapist provided support on all steps required to complete the task, preventing the occurrence of errors during the training. Furthermore, we also provided "scaffolding" by varying the complexity of the task. Thus, we both provided support on the aspects of the task that the inmates could not complete, while removing assistance wherever proficiency had been accomplished.

### *Procedures*

All participants gave written informed consent prior to inclusion in the study. Each participant was assessed twice, before and after cognitive remediation training. The second assessment was conducted within one week after the finalization of the program. In addition to the assessments on outcome measures, data were also collected on demographic and criminal characteristics.

The training sessions were individual and lasted 1 h. Sessions took place two or three days per week, depending on the inmate's schedule. Participants received a minimum of 20 sessions of training, which is considered necessary to achieve a change in cognition (Kontis, Huddy, Reeder, Landau, & Wykes, 2013). A mean of 28.32 (SD = 6.24) sessions of therapy were delivered and 71.43% of the sample received at least 25 sessions.

Paired comparisons between pre- and post-training using a two-tailed paired samples *t*-test were used to determine changes in neurocognition, psychological symptoms, and prison adjustment and behavior. Cohen's *d* effect sizes were also calculated for each variable.

## Results

Results of paired sample *t*-test and within-group effect sizes are presented in Table 2. After performing a statistical analysis and through the comparison of neurocognitive variables, significant changes ($p \leq 0.05$) across all functions were observed. With regards to psychological symptoms and prison behavior,

Table 2. Neurocognitive performance, psychological functioning, and prison adjustment and behavior before and after training.

| Test | Variables | Before training ($n = 28$) | | After training ($n = 28$) | | | | Effect size Cohen's $d$* |
|---|---|---|---|---|---|---|---|---|
| | | *M* | SD | *M* | SD | *t* | *p* | |
| HVLT-R | | | | | | | | |
| | TR | 22.29 | 4.83 | 28.07 | 4.93 | −6.83 | 0.00 | 1.2 |
| | DR | 7.96 | 2.30 | 10.36 | 1.77 | −7.72 | 0.00 | 1.19 |
| | RDI | 11.46 | 0.74 | 11.82 | 0.48 | −2.42 | 0.02 | 0.59 |
| NAB-Mazes | | 8.46 | 5.94 | 13.50 | 6.01 | −6.31 | 0.00 | 0.86 |
| TMT | | | | | | | | |
| | Part A | 71.61 | 54.82 | 50.50 | 22.96 | 2.84 | 0.01 | 0.51 |
| | Part B | 171.89 | 73.76 | 137.71 | 70.43 | 2.94 | 0.01 | 0.48 |
| RSC | | 2.57 | 1.26 | 3.21 | 1.10 | −2.71 | 0.01 | 0.55 |
| LNS | | 6.82 | 2.21 | 9.32 | 3.17 | −5.75 | 0.00 | 0.93 |
| D2 | | | | | | | | |
| | TTE | 288.86 | 82.59 | 326.32 | 97.60 | −2.60 | 0.02 | 0.42 |
| | CP | 98.11 | 45.22 | 127.46 | 49.17 | −6.78 | 0.00 | 0.63 |
| MSE | | 2.39 | 1.31 | 3.57 | 0.84 | −4.77 | 0.00 | 1.09 |
| DASS | | | | | | | | |
| | Depression | 3.39 | 2.54 | 2.18 | 2.06 | 2.51 | 0.02 | 0.53 |
| | Anxiety | 3.54 | 3.38 | 1.89 | 2.92 | 2.72 | 0.01 | 0.53 |
| | Stress | 5.93 | 3.40 | 4.00 | 3.15 | 2.54 | 0.02 | 0.60 |
| PBRS | | | | | | | | |
| | Anti-authority | 1.39 | 2.41 | 0.61 | 1.40 | 2.92 | 0.01 | 0.40 |
| | Anxious–Depressed | 8.39 | 6.14 | 4.57 | 3.16 | 4.27 | 0.00 | 0.80 |
| | Dull–Confused | 4.79 | 6.14 | 1.86 | 2.84 | 4.07 | 0.00 | 0.62 |
| PAQ | | | | | | | | |
| | Conflict | 1.93 | 2.68 | 1.43 | 1.83 | 1.06 | 0.30 | 0.22 |
| | Distress | 4.68 | 2.80 | 4.50 | 3.24 | 0.325 | 0.75 | 0.06 |
| | Total | 6.61 | 4.75 | 5.93 | 4.26 | 0.813 | 0.42 | 0.15 |

Notes: HVLT-R – Hopkins verbal learning test; TR – total recall; DR – Delay recall; RDI – recognition discrimination index; NAB-Mazes – neuropsychological assessment battery-Mazes test; TMT – trail making test; RSC – rule shift card; LNS – letter number sequence; D2 – the d2 cancellation test; TTE – total test effectiveness; CP – concentration performance; MSE – modified six elements; DASS – depression anxiety stress scales; PBRS – prison behavior rating scale; PAQ – prison adjustment questionnaire.
*≥0.8 = large; ≥0.5 = moderate; ≥0.2 = small (Cohen, 1988).

the paired *t*-test revealed significant decreases of both the DASS and the PBRS scores. Prison behavior also significantly improved. There were no statistically significant differences in the scores of any of the indicators of PAQ. Large effect sizes were found on TR and DR HVLT-R, NAB-Mazes, LNS, and MSE. Medium effect sizes were found on RDI HVLT-R, TMT Part A, RSC, D2 CP, DASS domains, and the Dull-Confused domain of the PBRS.

## Discussion

This study provides the first reported evidence for the efficacy of cognitive remediation intervention for female inmates in a prison context. Statistically significant positive changes were discovered across all neurocognitive domains, including attention, speed of processing, verbal learning and memory, cognitive flexibility, and planning. The medium to large effect sizes appear to confirm the role of cognitive remediation in improving neurocognitive functioning, especially executive functioning. Thus, this data converges with existing evidence demonstrating the effectiveness of cognitive remediation in clinical populations with neurocognitive deficits (Abbate-Daga, Buzzichelli, Marzola, Amianto, & Fassino, 2012; Anaya et al., 2012; Wykes et al., 2011).

In addition to the findings pertaining to the neurocognitive variables, we found a decrease in the negative emotional states of depression, anxiety, and tension/stress, as well as a decrease in disturbed behavior in prison. These findings are quite encouraging given that lack of emotional regulation and disruptive behavior constitute a major concern for those working in a correctional setting with incarcerated women (James & Glaze, 2006; Jordan, Schlenger, Fairbank, & Caddell, 1996; Lewis, 2006; Pinese, Furegato, & Santos, 2010). It is possible that the continuation of disruptive behavioral episodes can result in serious incidents and consequent punishment, which can further contribute to negative emotional states. It is important, to note, however, that some of the existing emotion regulation problems observed among the study's participants may also have been associated with factors not accounted for in the present study, such as Axis II disorders. In support of this suggestion, it has been reported that borderline personality disorder is highly prevalent among incarcerated woman (Sansone & Sansone, 2009).

It may be the case that cognitive remediation functions as an adjunctive effort to reduce symptoms seen in institutionalized samples, such as emotional regulation, and consequently contributes to improved behavioral control. It is possible that cognitive remediation offers a distraction from potentially negative or triggering internal events by directing attentional resources to external events instead. This corrective effect may result in more proper responses to the environment on one hand, and on the other hand reduce the tendency to engage in ruminative and negative thinking. We should note, however, that it is difficult to untangle if these outcomes are a consequence of improved inhibitory and regulation mechanisms resulting from the cognitive remediation or if they stem from the support offered by the therapists during the program (e.g. when giving extensive positive reinforcement).

Contrary to expectation, we observed no effect of cognitive remediation on the measure of subjective perception of adjustment to prison. The PAQ was originally designed to assess adjustment to prison in comparison with one's prior life in the community. This result suggests that cognitive remediation was not sufficient in encouraging functioning to levels deemed appropriate in the

community, at least not in the short-term. However, it is worth noting that, in the present study, adjustment to the prison setting was measured via a self-report measure, which may be susceptible to subjectivity and response bias, and may therefore not yield an accurate measure of adjustment (Dunning, Heath, & Suls, 2004).

There are several limitations to this preliminary report. First, the sample assessed in the present study was quite small, and there was an absence of a control group, or a placebo condition. The non-inclusion of a comparison groups limits the control for non-specific elements that could interfere with the reported improvements in functioning. It may have further impeded our ability to determine if the positive post-test scores were not merely a result of exposure to the pre-test. The second limitation is that we did not implement a follow-up period, which prevented the analysis of whether training effects are durable. The third limitation is that, although neurocognitive deficits are associated with recidivism and frequency of aggressive behavior, these factors were not monitored during our study. Also, we did not explore whether neurocognitive improvement was associated with better adherence to correctional rehabilitation or with a decrease in the number of punishments.

In closing, the improvement of neurocognition demonstrated by the participants encourages the application of a treatment format that integrates cognitive remediation interventions into efforts towards correctional rehabilitation. Findings support the continuation of research into the efficacy of cognitive remediation; however, better controlled research is needed to fully establish cognitive remediation as an intervention for the treatment of neurocognitive deficits of incarcerated women. Moreover, in face of the evidence of a possible difference in outcomes between cognitive remediation programs using learning strategies (like the program we used in this study) relative to those using drill and practice exercises (Krabbendam & Aleman, 2003), future studies should determine which is more efficacious for this population.

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