

# The Effects of the Growing Pro-Social Program on Cognitive Distortions and Early Maladaptive Schemas Over Time in Male Prison Inmates: A Randomized Controlled Trial

Nélio Brazão, Daniel Rijo, Maria do Céu Salvador, and José Pinto-Gouveia  
University of Coimbra

**Objective:** This randomized controlled trial aimed to assess the efficacy of a structured cognitive-behavioral group program, Growing Pro-Social (GPS), in reducing cognitive distortions and early maladaptive schemas over time in male prison inmates. **Method:** A total of 254 participants were recruited from nine Portuguese prisons and allocated to receive GPS ( $n = 121$ ) or treatment as usual ( $n = 133$ ). Participants were assessed with self-report measures on cognitive distortions and early maladaptive schemas at baseline, during intervention, at post-treatment and at 12 months' follow-up. Assessors were blind to group allocation. Treatment effects were tested with latent growth curve models. **Results:** At baseline, no significant differences between conditions were found. Results from latent growth curve models showed that condition was a significant predictor of change observed in all outcome measures over time. When compared with the control group, the treatment group showed a significant increase on adaptive thinking, and a significant decrease of cognitive distortions and early maladaptive schemas over time. Results also showed that treatment effects were maintained over time (12 months after GPS completion). Additionally, participants who completed the program presented higher improvements on cognitive distortions and early maladaptive schemas over time than noncompleters. **Conclusion:** This study showed that a structured cognitive-behavioral group program can have positive effects on the cognitive functioning of male prison inmates, by reducing cognitive distortions and the prominence of early maladaptive schemas.

## What is the public health significance of this article?

Antisocial behavior is a costly disorder for society (with a clear impact in public health), which per se sustains the need for the development of rehabilitation programs. When treating offenders in prisons, this study demonstrated the importance of taking into account structured cognitive-behavioral programs, especially those who directly address cognitive functioning.

**Keywords:** cognitive distortions, early maladaptive schemas, Growing Pro-Social, latent growth curve models, male prison inmates

The issue of what works and what doesn't work with offenders has received a lot of attention since the [Martinson \(1974\)](#) report suggesting that nothing works. Several meta-analyses have been undertaken, covering hundreds of studies. These meta-analyses have attempted to identify the features of effective interventions and, in many cases, have tried to quantify the impact of different types of treatment (for a review, see [Brazão, da Motta, & Rijo, 2013](#)). For instance, [Andrews and Bonta](#)

(2010a) argued that effective practice can be conceptualized as focusing on the principles of risk, need, and responsivity. The authors suggested that effective practice concentrate on medium to high-risk offenders, are focused on their criminogenic needs, and make use of structured cognitive-behavioral techniques or interventions.

Several well conducted meta-analyses have identified cognitive-behavioral programs as particularly effective interventions in reducing

Nélio Brazão, Daniel Rijo, Maria do Céu Salvador, and José Pinto-Gouveia, Research Unit of the Cognitive-Behavioral Research and Intervention Center, Faculty of Psychology and Education Sciences, University of Coimbra.

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Correspondence concerning this article should be addressed to Nélio Brazão, Centro de Investigação do Núcleo de Estudos e Intervenção Cognitivo-Comportamental da Faculdade de Psicologia e de Ciências da Educação da Universidade de Coimbra, Rua do Colégio Novo, 3001-802 Coimbra, Portugal. E-mail: [nelio-brazao@hotmail.com](mailto:nelio-brazao@hotmail.com)

recidivism among juvenile and adult offenders (Bonta et al., 2011; Koehler, Lösel, Akoensi, & Humphreys, 2013; Raynor, Ugwudike, & Vanstone, 2014; Trotter, 2013). Among the most disseminated cognitive-behavioral programs for adult offenders are the 22-session Enhanced Thinking Skills (ETS; Clark, 2000) and the 36-session Reasoning and Rehabilitation (R&R; Ross, Fabiano, & Ross, 1989) programs, both having a strong evidence-base (Cullen et al., 2012; McDougall, Perry, Clabour, Bowles, & Worthy, 2009; Tong & Farrington, 2006). These interventions have been identified as cognitive-restructuring programs, thus conceptualizing antisocial behavior as a consequence of maladaptive or dysfunctional thought processes, including cognitive distortions or thinking errors (Antonio & Crossett, 2016). These programs explicitly identify cognitive distortions as targets of change. The theoretical framework underlying these approaches argues that criminal thinking and criminal behavior are linked, and therefore changing one's criminal thought is paramount to changing one's criminal behavior (Landenberger & Lipsey, 2005; Lipsey, Landenberger, & Wilson, 2007). Therefore, the main goal is to teach offenders to understand the thinking processes that are strictly linked to their aggressive behavior. Learning to self-monitor thinking is typically the first step, after which the therapeutic techniques seek to help offenders to identify and correct biased thinking patterns. These techniques typically involve cognitive skills training, anger management, and components related to social skills and/or moral development (Antonio & Crossett, 2016; McGuire, 2011, 2013; Polaschek, 2011).

The role of social-cognitive biases and dysfunctional cognitions is relevant when trying to understand the cognitive correlates of aggressive and antisocial behavior, and a considerable amount of research has attempted to identify antisocial cognitions in offenders. For instance, Walters (1990, 2007) proposed that criminal behavior results from a life pattern characterized by irresponsibility, self-indulgence, interpersonal intrusion, and social rule-breaking, which is maintained by eight criminal thinking styles: mollification, cutoff, entitlement, power orientation, sentimentality, superoptimism, cognitive-indulgence and discontinuity (for a definition of each one of these thinking styles, see Walters, 1990). From a cognitive perspective, these criminal thinking styles could be conceptualized as cognitive distortions that offenders use when processing information, to justify their criminal conduct and/or to minimize the consequences of their own behavior (Brazão et al., 2015a). Offender's cognitive distortions have been conceptualized as criminogenic needs by the general personality and cognitive social learning model of Andrews and Bonta (2010a), defending that antisocial cognitions should be selected as targets of change.

Although the issue of criminal thinking styles has been frequently addressed by research, most studies addressing cognitive correlates of antisocial behavior failed to include negative core beliefs or early maladaptive schemas (EMSs), which from a cognitive perspective, underlie the offender's dysfunctional social information processing (Brazão et al., 2013, 2015a, 2015b). EMSs (e.g., Rafaeli, Bernstein, & Young, 2011; Young, Klosko, & Weishaar, 2003) may be defined as core cognitive structures comprising dysfunctional memories, emotions, and cognitions underlying dysfunctional interpersonal patterns and behaviors. EMSs are conceptualized as negative themes about the self and the others, that have their origin in early interactions with significant others, who do not meet the children's core needs (e.g., connection, acceptance, autonomy, safeness). Later in life, EMSs can be

triggered in any situation where schema-relevant information is available. Once an EMS is triggered it will then guide information processing in a way that maintains and reinforces that same EMS, by ignoring schema-inconsistent information and/or selecting schema-consistent information. From this point of view, antisocial behavior can be conceptualized as a result of a distorted view of the self and others, which leads to cognitive distortions in the social information processing. This distorted view (i.e., EMSs) will elicit attributions (i.e., cognitive distortions) that are consistently and negatively biased, which, in turn, will lead to dysfunctional behavior. For instance, one who endorses a mistrust/abuse schema and believes that others will hurt, abuse or humiliate the self, tends to perceive innocuous situations as threats, thus perceiving harmless remarks as disrespectful or deliberately provocative and, consequently, attacking others (Brazão et al., 2015a).

Growing up in threatening environments, with high rates of abandonment, emotional deprivation, neglect, and abusive experiences may contribute to the development of EMSs (Rafaeli et al., 2011; Rijo, Brazão, & Capinha, 2015; Thimm, 2010; Young et al., 2003). These rearing environments have been systematically associated with antisocial and aggressive behavior (Abram et al., 2004; Vagos, Ribeiro da Silva, Brazão, & Rijo, 2016), and some authors (e.g., Chakhssi, Bernstein, & de Ruiter, 2014; Gilbert & Daffern, 2013) suggested that particular combinations of EMSs may result in the development and maintenance of specific psychopathological disorders, including antisocial behavior. In forensic samples, the content and nature of EMSs have been reliably assessed via self-report methodology. A considerable amount of research (e.g., Calvete, 2008; Chakhssi et al., 2012; Gilbert & Daffern, 2013; Specht, Chapman, & Cellucci, 2009) found a positive association of mistrust/abuse, insufficient self-control and entitlement schemas with antisocial behavior. It is noteworthy that entitlement can also develop as an overcompensation for failure and defectiveness/shame schemas (Rafaeli et al., 2011). A more recent study (Shorey, Anderson, & Stuart, 2014) showed that schemas belonging to the disconnection/rejection domain, which includes mistrust/abuse, abandonment, emotional deprivation, defectiveness/shame and social isolation schemas, were positively associated with increased antisocial behavior. These results suggest that specific EMSs play a major role on the cognitive basis of antisocial behavior. Thus, it makes sense to select EMSs as targets of change when intervening with offenders. Schema-focused therapy is currently being offered to offenders and forensic patients (Farrell, Shaw, & Webber, 2009; Giesen-Bloo et al., 2006; Nadort et al., 2009; van Asselt et al., 2008), and has proven to be effective in reducing schema's endorsement, psychiatric symptoms, and aggressive and violent behavior. Additionally, Keulen-de Vos, Bernstein, and Arntz (2013) have made recommendations for the adaptation of schema therapy in forensic settings, suggesting that its theoretical model is useful in understanding the meaning behind events triggering violent and antisocial behavior. The same authors have been investigating the efficacy of schema therapy with antisocial and psychopathic offenders placed in forensic hospitals in the Netherlands, and preliminary results showed that schema therapy was capable of reducing recidivism risk and promoting reintegration into the community.

Despite these findings (and although research on the schema based-model applied to forensic samples is still a work in progress), few intervention programs for offenders take into account

the need of promoting change at a deeper level, such as EMSs, to modify antisocial behavior. To overcome this shortcoming, Rijo and colleagues (2007) developed the Growing Pro-Social (GPS) program, which is strongly based on schema theory (e.g., Rafaeli et al., 2011; Young et al., 2003). GPS was specifically designed to be used in the rehabilitation of offenders and conceptualizes aggressive behavioral patterns as a result of a distorted view of the self and the others. The program aims to achieve behavioral change through the change in cognitive correlates of antisocial behavior: EMSs, cognitive distortions and cognitive products. The ultimate goal is to reach some degree of change in specific EMSs, underlying the social information processing of offenders, such as: emotional deprivation, abandonment, mistrust/abuse, defectiveness/shame, social isolation/alienation, failure, entitlement, and insufficient self-control. GPS also tries to fight against resistance to change and cognitive rigidity of EMSs, by overcoming cognitive and emotional avoidance, as well as overcompensation through experiential tasks (for a detailed description of the program, see interventions section).

A pilot study was conducted to assess the program feasibility, as well as to establish initial efficacy of the GPS with male prison inmates. While the 24-treatment participants presented clinical improvement on cognitive distortions and EMSs, the majority of the 24-controls showed significant deterioration in those same variables between baseline and post-treatment assessments (Brazão et al., 2015a). However, this pilot study suffered from a number of methodological flaws, such as the small sample size in each group, the absence of blinding assessments and the lack of a follow-up assessment, thus impeding conclusions about stability of change over time. The current study tried to overcome limitations of previous research and consisted of a randomized controlled trial testing GPS's effects on cognitive distortions and EMSs in a larger sample of male prison inmates. This study's main goal was, therefore, to assess whether male prison inmates who participated in GPS showed changes on cognitive distortions and EMSs targeted by the program, when compared with the controls. Another goal was to examine the extent to which any improvements were maintained for 12 months after treatment completion. Additionally, the association between treatment dosage and change over time was analyzed in the treatment group, to investigate whether participants who completed the program presented higher improvements on cognitive distortions and EMSs than noncompleters. We expected that the GPS program would lead to a significant decrease of cognitive distortions and EMSs over time in the treatment group, when compared with the control group, and that these effects would be maintained over time. We also expected that participants who completed the program would present higher improvements on cognitive distortions and EMSs over time than noncompleters.

## Method

This randomized controlled trial was designed in accordance with APA Publications and Communications Board Working Group on Journal Article Reporting Standards (JARS; 2008) and the Consolidated Standards of Reporting Trials (CONSORT; Moher et al., 2010) Statement.

## Trial Design and Participants

This study was a randomized controlled trial with blind assessments, carried out between 2013 and 2016 in three city areas in mainland Portugal (Lisbon, Oporto and Coimbra) and in the Madeira Island. Participants were selected from male prison inmates aged between 18 and 40 years old from nine Portuguese prisons. The initial selection of inmates had the following exclusion criteria: (a) presence of cognitive disabilities (because GPS is not suitable for the cognitively impaired) or (b) psychotic symptoms (experiential strategies used in GPS are contraindicated for psychotic patients); (c) being under treatment for drug abuse/dependence (cessation or at least substantial reduction of drug or alcohol use must precede attendance of the GPS sessions); (d) being sentenced exclusively for sexual offenses (cognitive-behavioral interventions for sex offenders usually involve distinctive features tailored to those offenders specific needs); and (e) remaining in prison less than 24 months since the beginning of the program (taking into account GPS's 12-month length and 12-month follow-up assessment). Female prison inmates were also excluded from the sample because women represent less than 6% of the total prisoners in Portugal, and any possible idiosyncrasies from this cohort would be underrepresented.

**Sample size.** A power analysis showed that a sample of 203 inmates was necessary to detect medium effects with a significance level of .05 and a power of .90.

## Interventions

Cognitive-behavioral programs usually include different modules or sessions addressing cognitive, emotional and behavioral skills, assumed to be lacking in offenders. However, each of these skills tends to be seen as independent from the others instead of being conceptualized as intertwined with other variables (Rijo et al., 2007). For instance, emotional control sessions are carried out as if emotional control was totally independent from social reasoning or interpersonal behavior (Brazão et al., 2013). Another misconception of traditional approaches regards the methodologies adopted: there is a tendency to give preference to reasoning and school-like activities (e.g., paper and pencil), rather than experiential tasks that would be more suitable to increase self-knowledge and promote cognitive, emotional, and behavioral change.

In order to overcome some of these limitations, Rijo and colleagues (2007) developed a new cognitive-behavioral group program, the GPS—Growing Pro-Social, adapting its contents and methodology to the characteristics of offenders and to the risk-need-responsivity model (RNR; Andrews & Bonta, 2010a), namely the need and responsivity principles, by changing maladaptive thinking (considered a criminogenic need by the RNR model) with cognitive-behavioral techniques (the more effective strategies, in accordance with the RNR model). As previously stated, the GPS is strongly based in schema theory (e.g., Rafaeli et al., 2011; Young et al., 2003) and the program's main goal is changing specific EMSs underlying the offenders' social information processing. GPS is a manualized program of 40, 90-min, sessions which runs on a weekly basis. Sessions must be delivered by two therapists who should be skillful in cognitive-behavioral techniques and schema therapy.

The GPS's structure follows a progressive strategy of change, which begins by (a) increasing knowledge about the nature of

human communication, (b) changing maladaptive behavioral patterns in specific interpersonal contexts, (c) learning about cognitive distortions and counteracting their influence in the attribution of meaning to events, (d) experiencing and understanding the function and meaning of emotions and their influence on human behavior, and (e) learning about early maladaptive schemas and fighting against their influence on thoughts, emotions and behaviors. This gradual strategy of change requires the program to be delivered in a predefined sequence of five modules, (preceded by an initial session for the presentation of the program): (a) human communication, (b) interpersonal relationships, (c) cognitive distortions, (d) function and meaning of emotions, and (e) early maladaptive schemas (see Table 1). GPS ends with a final session, and follow-up sessions can be carried out afterward.

Although Modules 1 and 2 are focused in communication and interpersonal behavior, Modules 3, 4, and 5 address cognitive and

emotional variables. From the GPS 40 sessions, 16 of them are designed to directly address cognitive change. In six of these sessions, participants are encouraged to understand the way our mind processes social information. Common thinking errors (cognitive distortions) are identified, and participants are trained to think in a more realistic way about relevant daily events. In the other 10 sessions, EMSs, as well as their influence in the attribution of meaning to events, are identified. Participants are encouraged to fight against their own EMSs, diminishing the influence EMSs exert on thoughts, emotions and behavior. All sessions usually include experiential tasks, and participants are encouraged to achieve insight through systematic questioning about the reactions noticed during activities (guided discovery approach), and to apply this knowledge to real life situations.

The treatment group attended the GPS program for about 12 months, in addition to the treatment as usual (TAU) delivered at

Table 1  
*GPS Modules and Contents*

Modules	Number of sessions	Contents summary
Initial session	1	Presentation of the participants, the structure and the methodology of the program.
1. Human communication	5	The communication process and its obstacles; verbal and nonverbal communication skills, the ambiguity of human communication; the (in)congruences between digital and analogical languages.
2. Interpersonal relationships	10	Behavioral styles (assertive, aggressive, passive and manipulative) in relationships; self-concept and interpersonal behavior; ideas about the others and interpersonal behavior; specific interpersonal contexts and assertive behavior; negotiation as a strategy to deal with conflicts.
3. Cognitive distortions	6	Understanding cognitive distortions (thinking errors); identifying and changing cognitive distortions: Selective Abstraction, Overgeneralization, Mind Reading, Crystal Ball, Minimization, Disqualifying the Positive Experiences, Dichotomous Thinking, Labeling and Personalization.
4. Function and meaning of emotions	7	The diversity of the emotional experience; the nature and function of emotions: sadness, shame, fear, anger, guilt, and happiness.
5. Early maladaptive schemas	10	Early maladaptive schemas and their influence in giving meaning to reality; identifying and changing early maladaptive schemas: Failure, Social Isolation/Alienation, Mistrust/Abuse, Defectiveness/Shame, Emotional Deprivation, Abandonment/Instability, Grandiosity/Entitlement; fighting schema's influences in thoughts, emotions, and behavior.
Final session	1	Reflection and consolidation of learning, and generalization of gains made during the program.

*Note.* Adapted from "From multimodal programs to a new cognitive-interpersonal approach in the rehabilitation of offenders," by N. Brazão, C. da Motta and D. Rijo, 2013, *Aggression and Violent Behavior*, 18, 640.

Portuguese penitentiaries: supervision of school frequency, occupational and job-related tasks, sentence-planning supervision over time, and counseling by a psychologist in a regular basis (once per week). Participants in the control group received TAU and did not attend the GPS sessions or any structured intervention programs during the research period.

## Outcome Measures

Participants completed self-report measures of cognitive distortions and EMSs. Additionally, sociodemographic and legal data on participants were collected from prison staff members.

**Angry Cognitions Scale (ACS; Martin & Dahlen, 2007; Portuguese version by Leal, Veloso, Costa, & Simões, unpublished).** This scale consists of 54 items distributed across nine scenarios (e.g., “You get home from the drive-thru and realized that you were given the wrong food”). Participants are asked to imagine that the situation described in each scenario had just happened. For each scenario, there are six items referring to different thoughts that could arise during the situation, which can be rated on a five-point Likert-type scale (1 = *very unlikely* to 5 = *very likely*). In each group of items, five correspond to Maladaptive Processes addressing five thinking errors—Misattributing Causation, Overgeneralization, Inflammatory Labeling, Demandingness and Catastrophic Evaluation (for a definition of each one of these errors, see Martin & Dahlen, 2007). The remaining item in each scenario refers to the Adaptive Processes, which constitutes the second factor of this instrument (Martin & Dahlen, 2007).

The original version of the ACS presented good internal consistency values, with alphas ranging between .82 and .91 for each of the five thinking errors subscales, and an alpha of .79 for the subscale corresponding to Adaptive Processes (Martin & Dahlen, 2007). In a Portuguese study with male prison inmates, only two factors were identified—Maladaptive Processes and Adaptive Processes, with Cronbach’s alphas of .93 and .77, respectively (Leal, 2008).

In the current study, only Adaptive and Maladaptive main factors were taken into account (because the Portuguese study with offenders could not identify the five specific cognitive distortions). The Maladaptive Processes factor presented an alpha of .94, and the Adaptive Processes an alpha of .78.

**Young Schema Questionnaire (YSQ-S3; Young, 2005; Portuguese version by Pinto-Gouveia, Rijo, & Salvador, unpublished).** This is a widely used self-report questionnaire including 90 items, measuring the 18 EMSs proposed by Young (1990). Each EMS is evaluated using a set of five items listed randomly, which the individual rates using a Likert-type scale from 1 (*completely untrue to me*) to 6 (*describes me perfectly*). The YSQ’s psychometric properties have been extensively studied by several authors (Schmidt, Joiner, Young, & Telch, 1995; Soygüt, Karaosmanoglu, & Çakir, 2009; Stopa, Thorne, Waters, & Preston, 2001; Waller, Meyer, & Ohanian, 2001). Factor structure and discriminant power between clinical and nonclinical samples have also been studied (e.g., Rijkeboer, van den Bergh, & van den Bout, 2005). In Portuguese samples, a structure of 18 factors with moderate item-total correlations and high internal consistency ( $\alpha = .97$ ) was found (Rijo, 2009).

In the present study, only the eight EMSs proposed as underlying antisocial behavior by the GPS theoretical model (Rijo et al.,

2007) were taken into account. The total score (resulting from the sum of the eight EMSs) internal consistency was .89. As for the specific EMSs, the internal consistency was .83 for emotional deprivation, .78 for abandonment/instability, .84 for mistrust/abuse, .78 for social isolation/alienation, .76 for the defectiveness/shame, .81 for the failure, .89 for the grandiosity/entitlement and, finally, .75 for the insufficient self-control/self-discipline.

## Procedures

The current study was approved by the Ethics Committee of the Faculty of Psychology and Educational Sciences of the University of Coimbra where the Research Center is based. Additionally, researchers sought authorization by the Portuguese Data Protection Authority, in order to assure data protection from all participants involved in the study. A list of potential participants (who did not meet the exclusion criteria) was made available to the research team by psychologists from the justice system, after approval was obtained from the Head of the General Directorate of Reintegration and Prison Services of the Portuguese Ministry of Justice.

A large sample of participants was randomly selected using a random number table by a research assistant who was blind to any personal information about each inmate. In a first meeting between the research team and the randomized inmates, researchers explained the goals of the study and presented a brief overview of the treatment program. It was also explained to inmates that their participation in the study would not impact their sentencing in any way, and they were invited to participate voluntarily. Inmates who agreed to participate in the study were assessed at baseline, after they signed an informed consent. Then, participants were randomly assigned to treatment conditions (treatment and control groups) using a random number table by a research assistant who was blind to any information about each participant. Afterward, the research team informed the psychologists in each prison of the result of the randomization so that GPS could be initiated. Participants in the control group were informed that they would be offered the GPS treatment after the study’s completion (including the follow-up interval).

Assessments occurred at baseline, after the 20th session of the program (mid-treatment assessment), at the end of treatment and 12 months’ post-treatment (follow-up assessment) by independent research assistants, who received training in the self-report measures and were blind to group allocation. Respondent-specific codes were used to link the data from one time-point to the next one.

The program was delivered by two psychologists in each prison involved in the study, who already had training and experience in delivering the program with inmates. Program integrity and consistency was ensured through (a) delivery of sessions by two therapists; (b) group supervision meetings of facilitators to discuss previously delivered sessions and to prepare the following ones; and (c) regular meetings and supervision between program facilitators and researchers (including the program’s main author). It is noteworthy that the simultaneous presence of two experienced therapists in each session contributes to treatment fidelity. While one therapist is leading the session, the other one observes the implementation and helps in keeping it close to the program handbook. Furthermore, GPS’s structured and manualized design ensures, at least partially, that program integrity is respected.

Quality control procedures, such as recording sessions and/or the presence of external assessors in the GPS sessions, were not allowed in prisons.

## Data Analysis

Preliminary analyses included comparisons between the treatment and control group on demographic and legal data, using independent-samples *t* tests or chi-square tests depending on the nature of the data. Groups were also compared on the outcome measures at baseline, using independent-samples *t* tests. These preliminary analyses were carried out with the IBM SPSS Statistics v22.0.

Taking into account the longitudinal design of the research, intervention effects were tested by intent to treat analysis using latent growth curve models (LGCM; Duncan & Duncan, 1995). Although repeated measures statistical methods (e.g., ANOVA) can handle multiple data points, there is a growing recognition that these approaches may not be adequate when assessing change over time (Curran, Obeidat, & Losardo, 2010; Duncan & Duncan, 2009; Hesser, 2015). These traditional methods only analyze change in observed group means, thus being incapable of capturing individual differences in change (differences in trajectories are treated as error variance). Also, these methods assume that change in participants is linear. Alternatively, LGCM analyze both linear and nonlinear change, and individuals are allowed to differ on the rate of change in the dependent variables over time. Therefore, LGCM is a reliable method to assess individual variation in the growth of the dependent variables, and to examine if treatment condition might predict changes over time (Duncan & Duncan, 1995, 2009; Malmberg et al., 2015; B. O. Muthén, 1997; L. K. Muthén & Muthén, 2010).

In LGCM, the intercept (i.e., initial status) and slope (i.e., change over time) were modeled as latent variables from data at baseline (Time 1), mid-treatment (Time 2), post-treatment (Time 3) and follow-up (Time 4) assessments. First, unconditional models testing a linear and a nonlinear (i.e., quadratic trend) of change in the dependent variables over time were estimated separately in each group without predictors or control variables. Effect sizes for the rate of change observed in the dependent variables in each group were calculated using Cohen's *d*, with 0.2 indicating a small effect, 0.5 a medium effect and 0.8 a large effect (Cohen, 1988).

After establishing the unconditional models, the association between condition and change over time was examined by including condition (control group vs. treatment group coded as 0 and 1, respectively) as a predictor of the growth factors (i.e., intercept and slope). The path from condition to intercept reflects group differences at the baseline and should be nonsignificant due to randomization. The path from condition to slope reflects group differences on the trajectory of change in the dependent variables over time. Additionally, the association between treatment dosage and change over time in the outcome measures was analyzed in the treatment group by including the number of sessions ( $\leq 32$  sessions vs.  $\geq 32$  sessions coded as 0 and 1, respectively) as a predictor of the rate of change. A cut-off of  $\geq 32$  sessions (80% of attendance) was used to classify participants as completers, following the recommendations by Cullen and colleagues (2012).

In all LGCM, Full Information Maximum Likelihood Estimation was used to handle missing data according to a proposal by Muthén and Muthén (2010). Thus, all participants with at least two complete measures for each outcome were included in the analyses. For each LGCM, chi-square, comparative fit index (CFI), root-mean-square error of approximation (RMSEA) and the standardized root-mean square residual (SRMR) were used as model fit indices. Following the guidelines by Hair, Black, Babin, and Anderson (2005), and taking into account our sample size ( $< 250$ ), a CFI  $> .95$  combined with either RMSEA  $< .08$  or a SRMR  $< .08$  were considered as indicators of acceptable/good fit. All LGCM were carried out using Mplus v7.4 (Muthén & Muthén, 2010). For a graphical representation of LGCM, see Appendix A.

## Results

### Recruitment and Retention

A sample of 270 inmates, who did not meet the exclusion criteria, were invited to participate in the study (see Figure 1). After this first selection, 16 (5.9%) inmates declined to participate, and 254 (94.1%) inmates completed the baseline assessment and were randomly assigned to treatment and control groups.

From the initial 121 treatment group participants, 108 (89.2%) completed the mid-treatment assessment, 97 (80.1%) completed the post-treatment assessment and 69 (57.0%) completed the follow-up assessment. Only 17 (14.0%) inmates dropped out the program. The majority of losses to subsequent assessments was due to transference to another prison or parole. Of the 121 inmates randomized to GPS, 79 (65.4%) attended more than 32 sessions, 19 (15.7%) attended between 31 and 21 sessions, 12 (9.9%) attended between 20 and 11 sessions, and 11 (9.0%) attended less than 10 sessions. Inmates attended in average 30 sessions ( $M = 30.18$ ;  $SD = 11.45$ ) of the program.

From the initial 133 control participants, 104 (85.9%) completed the mid-treatment assessment, 89 (66.9%) completed the post-treatment assessment and 67 (50.3%) completed the follow-up assessment.

### Baseline Differences

Treatment and control groups were compared on demographic characteristics, and no significant differences were found (all  $p > .05$ ). In treatment and control groups, the mean age was 28.24 ( $SD = 6.32$ ) and 28.74 years old ( $SD = 6.14$ ), respectively. Participants were mostly single (69.4% in the treatment group and 70.7% in the control group), with a low socioeconomic status<sup>1</sup> (94.2% in the treatment group and 97.0% in the control group).

The groups were also compared concerning legal and criminal features, and no significant differences were found (all  $p > .05$ ). In

<sup>1</sup> Socioeconomic status (SES) was measured by inmates' profession, considering the Portuguese professions classification (Instituto Nacional de Estatística, 2011). Examples of professions in the high SES group are judges, higher education professors, or medical doctors; in the medium SES group are nurses, psychologists, or school teachers; and in the low SES group are farmers, cleaning staff, or undifferentiated workers.

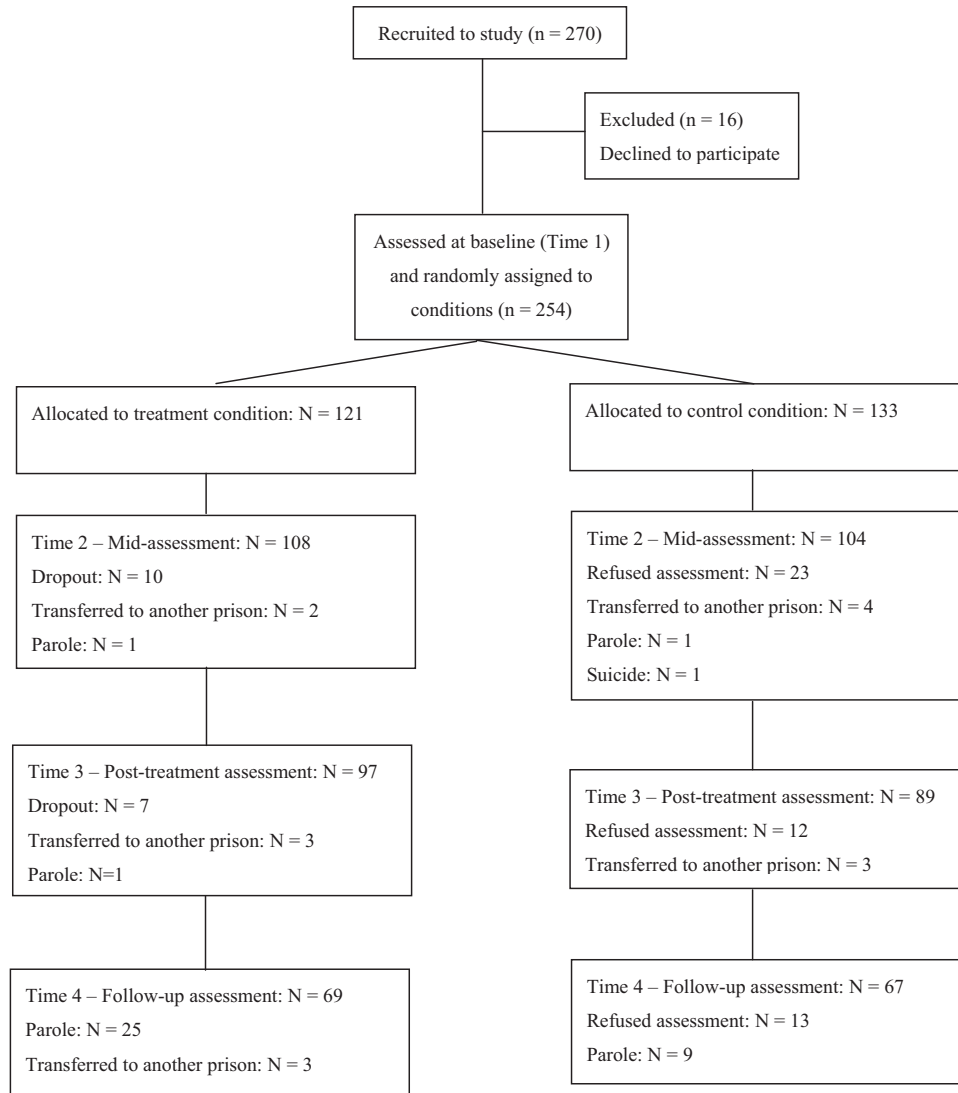


Figure 1. Flowchart of inmate participation.

treatment and control groups, the average sentence length was 111.53 ( $SD = 59.25$ ) and 120.76 months ( $SD = 63.22$ ), respectively. Although participants were mainly first-time offenders (62.8% in the treatment group and 60.9% in the control group), most of them were charged in the current conviction for having committed several crimes (56.2% in the treatment group and 50.4% in the control group). Crimes for which they were sentenced to prison were predominantly against property (55.4% in the treatment group and 51.1% in the control group), followed by crimes against people (28.7% in the treatment group and 31.6% in the control group), drug-related offenses (14.2% in the treatment group and 13.5% in the control group), and crimes against the state (1.7% in the treatment group and 3.8% in the control group).<sup>2</sup>

Baseline differences between groups were also tested for all outcome measures (see Table 2). No differences were found between conditions at the onset of the study. Overall, these results indicated that randomization was successful.

## Intervention Effects on Cognitive Distortions and EMSs

As previously stated, unconditional models were performed separately by each condition.<sup>3</sup> Next, conditional models with condition as a predictor of the growth factors (i.e., intercept and slope) were examined.

**Unconditional models in the treatment group.** A linear and nonlinear (i.e., quadratic) trend of the unconditional models of

<sup>2</sup> Crimes against property include robbery, theft and qualified theft; Crimes against people include simple and aggravated assault, intimidation, kidnapping, attempted homicide and homicide; and crimes against the state include counterfeiting and forgery of documents.

<sup>3</sup> For a graphical representation of change over time on cognitive distortions and EMSs (total score) in treatment and control groups, see Appendix C.

Table 2  
Baseline Differences on the Outcome Measures by Group

Outcome measures	Treatment group		Control group		<i>t</i>	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Angry Cognitions Scale (ACS)							
Maladaptive processes	122.42	29.06	124.27	30.05	0.495	.621	.06
Adaptive processes	32.03	6.07	31.81	6.14	0.288	.774	.03
Young Schema Questionnaire (YSQ-S3)							
Emotional deprivation	2.06	1.08	2.18	1.17	0.848	.397	.10
Abandonment/Instability	3.00	1.03	3.22	1.27	1.505	.134	.19
Mistrust/Abuse	2.77	0.99	2.86	1.10	0.699	.485	.08
Social isolation/Alienation	2.15	0.83	2.28	0.98	1.127	.261	.14
Defectiveness/Shame	1.63	0.64	1.70	0.84	0.796	.427	.09
Failure	1.65	0.56	1.75	0.80	1.172	.243	.14
Grandiosity/Entitlement	2.45	0.83	2.48	1.00	0.311	.756	.03
Insufficient self-control	2.22	0.80	2.36	00.99	1.287	.199	.15
Total score (8 schemas)	2.24	0.58	2.36	.75	1.396	.172	.17

Note. Maladaptive Processes include the following cognitive distortions: Misattributing Causation; Overgeneralization; Inflammatory Labeling; Demand-ingness; and Catastrophic Evaluations.

change in the dependent variables over time were tested. Although a significant quadratic trend was found for the insufficient self-control EMS and for the EMSs total score, it did not achieve acceptable fit.<sup>4</sup> For the remaining variables, none of the models showed a significant quadratic trend. Therefore, only the linear trend was included in the following models. The linear trend of the unconditional models presented good fit indices to the observed data (see Appendix B).

As presented in Table 3, and for the Maladaptive and Adaptive Processes, the average slopes were significant. Although scores on Maladaptive Processes decreased over time (as indicated by the negative slope), levels of Adaptive Processes increased over time (as indicated by the positive slope). The effect sizes for the rate of change observed in Maladaptive and Adaptive Processes were large and medium, respectively. In addition, an individual variation around the mean of the growth trajectory of Maladaptive Processes was found, as indicated by the significant slope factor variance. For the Adaptive Processes, the slope factor variance was nonsignificant.

For all the specific EMSs and for the total score, the average slopes were significant, indicating that schema's endorsement decreased over time. The effect sizes for the rate of change observed in those same variables were medium or large. Additionally, individual differences around the mean of the growth trajectory of Mistrust/Abuse, Abandonment/Instability, Social Isolation/Alienation and Insufficient Self-Control EMSs were found. For the remaining EMSs and total score, the slope factor variance was nonsignificant.

**Unconditional models in the control group.** Linear and quadratic trends of the unconditional models in the control group were also tested. Besides EMSs total score, none of the models showed a significant quadratic trend. As such, only the linear trend was included in the subsequent analyses. The linear trend of the unconditional models showed good fit indices to the data (see Appendix B).

As reported in Table 4, and for Maladaptive and Adaptive Processes, results showed that scores on these variables decreased over time; however, the average slope was only significant for the

Adaptive Processes, and the observed effect size was medium. For both variables, the average variances of the slopes were significant, indicating individual variation around the mean of the growth trajectories. For all EMSs, and although results showed a slight increase on the scores of these variables over time, the average slopes were always nonsignificant. Individual differences around the mean of the growth trajectory of all EMSs were found.

**Conditional models with group as a predictor of the growth factors.** The conditional models with group (control vs. treatment) as a predictor of the growth factors provided good fit indices to the observed data (see Appendix B).

As presented in Table 5, condition did not predict variation in the intercept, indicating that the groups did not differ in self-reported cognitive distortions and EMSs scores at baseline. On the other hand, condition was a significant predictor of change over time observed in all outcome measures. Specifically, the treatment group showed a greater increase (of almost 3 units) in Adaptive Processes than the control group, as indicated by the positive B value. Treatment participants also showed a greater decrease (of almost 8 units) in Maladaptive Processes than controls, as indicated by the negative B value. Finally, the treatment group presented a greater decrease in EMSs total score than the control group, as indicated by the negative B value (−.253). The same tendency of results was found for all specific EMSs.

**Conditional models with treatment dosage as predictor of the rate of change in the treatment group.** Additionally, conditional models with treatment dosage (i.e., ≤32 sessions vs. ≥32 sessions) as predictor of the rate of change in Maladaptive and Adaptive Processes, and in EMSs total score were analyzed in the treatment group. As previously specified, participants that completed at least 32 sessions were considered completers. In turn, participants that attend less than 32 sessions were considered

<sup>4</sup> Fit indices for the insufficient self-control EMS:  $\chi^2 = 14.172$ ,  $p = .014$ ; CFI = .729; RMSEA = .147; SRMR = .097; Fit indices for the EMSs total score:  $\chi^2 = 22.225$ ,  $p < .001$ ; CFI = .767; RMSEA = .201; SRMR = .108.



Table 3

*Unconditional Model of the Rate of Change (Slope) in Maladaptive and Adaptive Cognitive Processes and Early Maladaptive Schemas in the Treatment Group*

Outcome measures	T1	T2	T3	T4	T1-T4	Slope	Slope (V)
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	Cohen's <i>d</i>		
Angry Cognitions Scale (ACS)							
Maladaptive processes	122.30 (29.99)	115.18 (31.93)	88.98 (30.37)	125.60 (29.96)	1.10	-8.33***	13.75***
Adaptive processes	32.13 (6.06)	33.25 (6.07)	34.28 (6.92)	36.13 (6.28)	.64	.90***	2.51
Young Schema Questionnaire (YSQ-S3)							
Emotional deprivation	2.05 (1.11)	1.90 (.96)	1.61 (.85)	1.37 (.59)	.76	-.18***	.05
Abandonment/Instability	3.01 (1.05)	2.66 (1.13)	2.19 (1.03)	1.75 (.78)	1.36	-.33***	.10***
Mistrust/Abuse	2.76 (1.01)	2.64 (1.06)	2.35 (1.09)	1.83 (.77)	1.03	-.22***	.11***
Social isolation/Alienation	2.16 (.85)	1.96 (.85)	1.75 (.72)	1.54 (.59)	.84	-.13**	.07***
Defectiveness/Shame	1.62 (.63)	1.44 (.61)	1.33 (.51)	1.22 (.33)	.79	-.09**	.02
Failure	1.65 (.57)	1.54 (.52)	1.43 (.53)	1.29 (.40)	.73	-.08**	.04
Grandiosity/Entitlement	2.46 (.85)	2.05 (.83)	1.89 (.75)	1.57 (.43)	1.32	-.21***	.03
Insufficient self-control	2.20 (.80)	1.98 (.81)	1.79 (.72)	1.56 (.56)	.92	-.013***	.07**
Total score (8 schemas)	2.24 (.59)	2.02 (.59)	1.79 (.60)	1.51 (.44)	1.40	-.19***	.02

*Note.* Maladaptive Processes include the following cognitive distortions: Misattributing Causation; Overgeneralization; Inflammatory Labeling; Demand-ingness; and Catastrophic Evaluations. Slope (V) = Variance of the slope.

\*\*  $p < .05$ . \*\*\*  $p < .001$ .

noncompleters. Results showed that treatment dosage was a significant predictor of change over time observed in the outcome measures. Specifically, completers showed a greater increase in Adaptive Processes ( $B = 1.987$ ;  $p = .001$ ), and a greater decrease in Maladaptive Processes ( $B = -5.051$ ;  $p = .041$ ) and EMSs total score ( $B = -.166$ ;  $p = .003$ ) when compared with the noncompleters.

### Discussion

This study aimed to test the efficacy of the Growing Pro-Social (GPS) program in reducing cognitive distortions and early maladaptive schemas (EMSs) over time in male prison inmates. Specifically, it was assessed whether offenders who participated in GPS showed

change on cognitive distortions and EMSs targeted by the program, when compared with the controls. It was also examined the extent to which any improvements were maintained for 12 months after GPS completion. The association between treatment dosage and change over time was also analyzed, in order to investigate whether participants who completed the GPS sessions presented higher improvements on cognitive distortions and EMSs than noncompleters. To our best knowledge, this was the first randomized controlled trial carried out in Portuguese prisons. It was also the first study to test the effects of a cognitive-behavioral group program with offenders using latent growth curve models (LGCM).

Data on recruitment and retention, showed that the majority of the inmates randomized to GPS (65.4%) completed the interven-

Table 4

*Unconditional Model of the Rate of Change (Slope) in Maladaptive and Adaptive Cognitive Processes and Early Maladaptive Schemas in the Control Group*

Outcome measures	T1	T2	T3	T4	T1-T4	Slope	Slope (V)
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	Cohen's <i>d</i>		
Angry Cognitions Scale (ACS)							
Maladaptive processes	125.60 (29.96)	120.72 (33.75)	125.22 (35.77)	124.62 (33.66)	.03	-.05	14.26***
Adaptive processes	31.65 (6.41)	30.69 (6.46)	30.61 (8.34)	26.11 (10.37)	.64	-1.17**	8.09**
Young Schema Questionnaire (YSQ-S3)							
Emotional deprivation	2.21 (1.17)	2.00 (1.04)	2.09 (1.11)	2.30 (1.11)	.07	.03	.20***
Abandonment/Instability	3.29 (1.27)	2.71 (1.14)	2.75 (1.15)	2.87 (1.01)	.36	.01	.15***
Mistrust/Abuse	2.89 (1.10)	2.74 (1.16)	2.76 (1.18)	2.96 (1.10)	.06	.05 <sup>ns</sup>	.12**
Social isolation/Alienation	2.30 (.98)	2.15 (1.05)	2.39 (1.06)	2.46 (1.10)	.15	.06	.19***
Defectiveness/Shame	1.71 (0.87)	1.67 (0.88)	1.83 (0.89)	1.99 (0.98)	.30	.09	.16**
Failure	1.72 (.78)	1.65 (.77)	1.94 (1.02)	2.07 (1.03)	.38	.09	.11**
Grandiosity/Entitlement	2.48 (.94)	2.32 (1.01)	2.35 (.91)	2.36 (.92)	.12	-.03	.08**
Insufficient self-control	2.36 (.97)	2.17 (1.03)	2.19 (.91)	2.22 (.99)	.14	.05	.09**
Total score (8 schemas)	2.37 (.75)	2.18 (.78)	2.29 (.83)	2.41 (.84)	.05	.04	.12**

*Note.* Maladaptive Processes include the following cognitive distortions: Misattributing Causation; Overgeneralization; Inflammatory Labeling; Demand-ingness; and Catastrophic Evaluations. Slope (V) = Variance of the slope.

\*\*  $p < .05$ . \*\*\*  $p < .001$ .

Table 5  
*Conditional Model With Condition as Predictor of the Initial Level (Intercept) and Rate of Change (Slope) in Maladaptive and Adaptive Cognitive Processes and Early Maladaptive Schemas*

Outcome measures	Intercept		Slope	
	B	p	B	p
Angry Cognitions Scale (ACS)				
Maladaptive processes	-2.812	.448	-7.939	<.001
Adaptive processes	-.029	.971	2.775	<.001
Young Schema Questionnaire (YSQ-S3)				
Emotional deprivation	.006	.966	-.253	<.001
Abandonment/Instability	-.050	.759	-.266	<.001
Mistrust/Abuse	.001	.992	-.392	<.001
Social isolation/Alienation	-.112	.381	-.253	<.001
Defectiveness/Shame	-.061	.581	-.201	<.001
Failure	-.024	.803	-.215	<.001
Grandiosity/Entitlement	-.046	.718	-.219	<.001
Insufficient self-control	-.098	.438	-.250	<.001
Total score (8 schemas)	.006	.996	-.253	<.001

Note. Maladaptive Processes include the following cognitive distortions: Misattributing Causation; Overgeneralization; Inflammatory Labeling; Demandingness; and Catastrophic Evaluations.

tion (32 or more sessions). It is noteworthy that only a small number of inmates (14.0%) dropped out the program. These data suggested that GPS's length and methodology may account for the favorable program retention. Losses observed in follow-up assessments in the treatment group were mainly due to external variables, such as transference to another prison and/or parole, that researchers could not overcome. The same occurred in the control group, although a considerable percentage of inmates from this group refused to complete subsequent assessments (namely between mid-treatment and follow-up assessments). Nonetheless, and in accordance with the JARS and CONSORT guidelines (APA Publications and Communications Board Working Group on Journal Article Reporting Standards, 2008; Moher et al., 2010), an intent-to-treat analysis was followed and all participants (including the noncompleters from both groups) were included in the subsequent analyses. Including only the completers in the analyses would introduce selection bias into the findings (Antonio & Crossett, 2016; APA Publications and Communications Board Working Group on Journal Article Reporting Standards, 2008; Moher et al., 2010).

Comparisons between treatment and control groups on demographic and criminal features, as well as in the outcome measures at baseline, revealed nonsignificant differences between groups. This result sustains that randomization was successful, thus allowing for reliable conclusions on the predictor effect of condition on cognitive distortions and EMSs over time.

Results from LGCM showed that condition was a significant predictor of change over time observed in all outcome measures. Concerning adaptive thinking (i.e., adaptive cognitive processes), while the treatment group presented an increase over time, the control group showed a decrease over time. This result supports the idea that GPS is capable of changing the way inmates process social information, promoting a more realistic, healthy and prosocial thinking style. The decrease of adaptive thinking over time

observed in controls also suggests that GPS may be effective in buffering a tendency to get worse across time while in prison.

Regarding cognitive distortions (i.e., maladaptive cognitive processes), the treatment participants presented a greater and significant decrease of cognitive distortions over time, when compared with the controls. This result is co-occurrent with findings observed for adaptive thinking, in which treatment participants showed an improvement, whereas controls showed a worsening in this same variable. The deterioration observed in this group may be explained by the fact that controls did not receive any intervention program during the research period (i.e., there was no accounting for dosage), which may suggest that the usual penitentiary treatment (when not including specific intervention programs) may not be effective in changing maladaptive cognitions that are associated with aggressive and antisocial behavior, and recidivism risk (Constantine, Robst, Ander, & Teague, 2012; Martin, Dorken, Wamboldt, & Wootten, 2012; Morgan et al., 2012). These findings stress the need to provide appropriate treatment programs to inmates, namely the ones focused in offender's cognitive malfunctioning (McGuire, 2006, 2008, 2011, 2013; Hollin, Palmer, & Hatcher, 2013), as shown by the GPS's ability to, on one hand, decrease maladaptive thinking processes and, on the other hand, increase the use of adaptive thinking strategies.

Results also pointed out to a significant decrease of EMSs over time in the treatment group, when compared with the control group, who showed no change over time in these variables. According to schema theory (e.g., Rafaeli et al., 2011; Young et al., 2003), lower scores on schema measures may be interpreted as a lower prominence of EMSs in the individual's self-concept. As such, EMSs decrease their influence on associated cognitive distortions and dysfunctional cognitive products. Consequently, attribution of meaning can be made in a more realistic way, less influenced by EMSs. Once the ultimate goal of the GPS (according to its theoretical approach) is to promote changes in self-representation, these findings support the program's ability to produce change at this level of cognitive functioning. Moreover, improvements for both cognitive distortions and EMSs were sustained over time (12 months after GPS completion), suggesting that those who participated in the program continued to use and consolidate the strategies learned in sessions after they finished treatment, which is one the GPS's main goals (Brazão et al., 2013; Rijo et al., 2007).

It is important to add that a reduction on cognitive distortions and EMSs was observed from Time 1 (baseline assessment) to Time 2 (mid-treatment assessment), which is prior to cognitive distortions and EMSs sessions being delivered. Although GPS's Module 1 and 2 are focused in communication and interpersonal behavior, the main goal of these modules is to increase participants' awareness of the ambiguity of human communication and the subjectivity of information processing in interpersonal contexts. Also, participants are challenged to identify the frequent misattribution of others' behavior toward oneself, thus becoming more conscious about cognitive distortions underlying the attribution of meaning to interpersonal behaviors, thus modifying those same distortions and, consequently, core schemas to a certain degree. These modules were, therefore, developed to promote some degree of change at a cognitive level (Brazão et al., 2013; Rijo et al., 2007). This initial work may explain, at least partially, the change observed in cognitive distortions and EMSs before the subsequent specific modules. Another possible explanation may be

related to nonspecific factors, namely the fact that inmates were included in a regular group activity, which per se might be helpful, considering that inmates participating in this study did not attend any other intervention program or treatment.

Additional analyses on treatment dosage as predictor of change over time in the treatment group showed that completers (i.e., participants that completed at least 32 sessions) presented, on one hand, a greater increase in adaptive thinking and, on another hand, a greater decrease in maladaptive thinking and in schema's endorsement than noncompleters (i.e., participants that attended less than 32 sessions). These findings emphasize the need for therapists to engage participants with the full treatment, in order to maximize the GPS's effects. This issue is especially relevant, taking into account that dropouts typically reoffend at a higher rate than treatment completers (Bennett, Stoops, Call, & Flett, 2007; Kroner & Takahashi, 2012; Prendergast, Hall, Wexler, Melnick, & Cao, 2004).

Overall, findings from this randomized controlled trial offer evidence of GPS's efficacy in changing the cognitive biases that seem underlie antisocial behavior. If this cognitive malfunctioning can be seen as a correlate of behavioral and emotion regulation difficulties (Brazão et al., 2013; Rijo et al., 2007), then EMSs should be selected as targets of change (Brazão et al., 2015a; Farrell et al., 2009; Giesen-Bloo et al., 2006; Nadort et al., 2009; van Asselt et al., 2008) and programs should promote cognitive change at this level, instead of focusing uniquely on cognitive distortions. Results also support the idea that it is possible to achieve cognitive change with structured interventions that consume fewer human and economic resources (Andrews & Bonta, 2010a, 2010b; Bonta & Wormith, 2013; McGuire, 2006, 2008, 2011, 2013; Hollin et al., 2013), and that this kind of programs can, at least partially, ensure that individuals in contact with the justice system receive appropriate intervention, addressing relevant psychological needs of prison inmates.

The fact that cognitive distortions and EMSs are usually assessed through self-report measures encompasses one of the limitations of the current research, because this kind of measures is not free of response bias. Another limitation has to do with the outcome measures used in the current study, which were not specifically developed for offenders. Although other instruments (e.g., the Psychological Inventory of Criminal Thinking Styles or the Measure of Criminogenic Thinking Styles) may be more adequate to assess antisocial cognitions, to our best knowledge these same measures were not adapted and/or validated for Portuguese samples, at the onset of the study. Alternatively, researchers used the Angry Cognitions Scale (Martin & Dahlen, 2007) that has been previously validated with Portuguese male prison inmates. Moreover, this instrument assesses not only cognitive distortions but also adaptive thinking. Taking into account that researchers were interested in assessing the GPS capability to reduce cognitive distortions, but also to promote adaptive thinking (because a reduction in cognitive distortions does not necessarily lead to a more adaptive thinking), this instrument seemed to be a proper alternative. Finally, and taking into account that the GPS's main goal is to change specific EMSs, researchers used the YSQ (Young, 2005)—which is a widely used self-report questionnaire to measure EMSs—to assess change in those same variables.

The integrity of GPS delivery was ensured by training and supervising psychologists who run the program. However, no

systematic quality control procedures of the program's delivery were carried out in the current study. As previously stated, recording sessions or the presence of external assessors in sessions were not allowed in prisons.

The effects of the GPS in the reduction of criminal recidivism rates were not analyzed in this study. The positive effects of a rehabilitation program over recidivism rates are usually presented as a major requirement for the selection of effective intervention practices (e.g., McGuire, 2011, 2013). However, a recent trend in research (e.g., Antonio & Crossett, 2016; Skeem, Polaschek, & Manchak, 2009) has begun to study other relevant variables as outcome measures, besides criminal recidivism reduction. The current study added to this new-wave of research and proposed to test the effects of a structured cognitive-behavioral group intervention on cognitive correlates of antisocial behavior. Nonetheless, it seems of the utmost importance to test if the positive changes in cognitive distortions and EMSs results in a significant reduction of reoffending and/or criminal recidivism. As previously stated, participants in the control group were informed that they would be offered the GPS treatment after the study's completion. This waiting list control design eliminates the possibility of the control group being used for any recidivism follow-up study. However, this design allows the replication of the observed findings in the current treatment group when controls undertake GPS. Finding a similar pattern of change in the control group would confirm the GPS's positive effects on the cognitive correlates of antisocial behavior.

Future studies should assess other relevant variables associated with antisocial behavior (such as emotional variables), as well as variables that do not rely exclusively on self-report measures (e.g., behavioral measures, disciplinary incidents and prison records). Taking into account the individual variability of change in cognitive distortions and EMSs observed in the current study, future research should test for relevant variables that could explain this same variability. Testing moderators of treatment effects is another important topic to be addressed in further research.

This randomized controlled trial confirms and extends previous findings from a former pilot study (Brazão et al., 2015a), and showed that GPS can have positive effects on the cognitive functioning of male prison inmates, by reducing cognitive distortions and the prominence of EMSs in offender's social information processing. Future multimodal programs delivered to prison inmates should consider the cognitive functioning at different levels, in order to optimize treatment effects and adopt a more comprehensive approach to treatment. In conclusion, findings presented in this paper represent the first attempt to perform a randomized controlled trial of the GPS program in Portuguese prisons. However, replication of these findings with other type of offenders (e.g., female offenders) and/or in other settings (e.g., in community-based interventions), as well as in other countries, will speak to the generalizability of the program in promoting change in the full range of the offenders' cognitive functioning.

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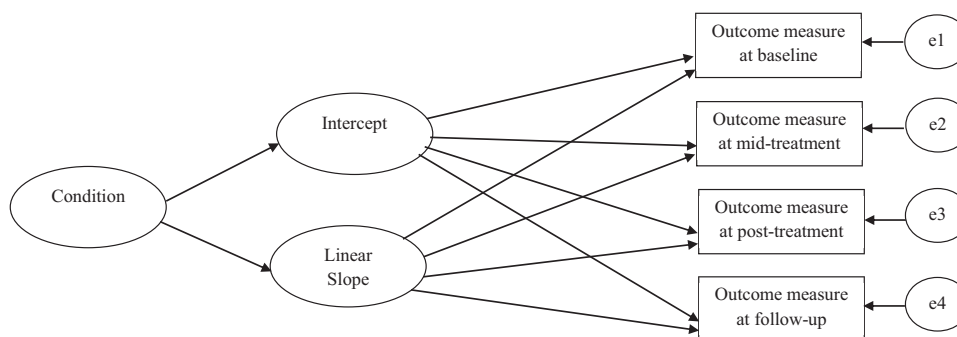
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## Appendix A

### Latent Growth Curve Model for One Outcome Measure Measured on the Four Timepoints With Condition as Predictor



*Note.* The factor loadings for the intercept were set to 1, and the factor loadings for the linear slope were fixed to 0 at baseline, 1 at mid-treatment, 2 at post-treatment and 4 at follow-up. Condition was coded as 0 = control group and 1 = treatment group.

(Appendices continue)

## Appendix B

## Model Fit Indices for the Unconditional Models in the Treatment and Control Groups, and for the Conditional Model With Condition as Predictor

Outcome measures	$\chi^2$	$\chi^2 p$	CFI	RMSEA	SRMR
Unconditional model in the TG					
Angry Cognitions Scale (ACS)					
Maladaptive processes	5.742	.332	.994	.037	.028
Adaptive processes	5.133	.399	.996	.018	.079
Young Schema Questionnaire (YSQ-S3)					
Emotional deprivation	3.331	.649	1.000	.000	.049
Abandonment/Instability	1.419	.922	1.000	.000	.027
Mistrust/Abuse	2.629	.756	1.000	.000	.040
Social isolation/Alienation	5.565	.350	.982	.036	.064
Defectiveness/Shame	7.614	.178	.959	.072	.059
Failure	0.443	.994	1.000	.000	.014
Grandiosity/Entitlement	8.192	.146	.953	.080	.059
Insufficient self-control	5.565	.350	.982	.036	.064
Total score (8 schemas)	3.641	.820	1.000	.000	.040
Unconditional model in the CG					
Angry Cognitions Scale (ACS)					
Maladaptive processes	1.371	.927	1.000	.000	.037
Adaptive processes	6.819	.288	.964	.053	.081
Young Schema Questionnaire (YSQ-S3)					
Emotional deprivation	8.025	.154	.967	.077	.075
Abandonment/Instability	5.686	.338	.986	.037	.051
Mistrust/Abuse	5.077	.406	.998	.013	.067
Social isolation/Alienation	2.861	.721	1.000	.000	.039
Defectiveness/Shame	3.628	.821	1.000	.000	.044
Failure	7.614	.178	.959	.072	.059
Grandiosity/Entitlement	8.192	.146	.953	.080	.059
Insufficient self-control	6.499	.482	1.000	.000	.030
Total score (8 schemas)	5.686	.338	.986	.037	.051
Conditional model					
Angry Cognitions Scale (ACS)					
Maladaptive processes	9.885	.196	.987	.044	.051
Adaptive processes	5.742	.322	.994	.037	.028
Young Schema Questionnaire (YSQ-S3)					
Emotional deprivation	8.195	.147	.963	.071	.042
Abandonment/Instability	3.641	.820	1.000	.000	.040
Mistrust/Abuse	10.531	.160	.984	.049	.048
Social isolation/Alienation	6.782	.451	1.000	.000	.037
Defectiveness/Shame	1.626	.203	.990	.079	.027
Failure	5.565	.350	.982	.036	.064
Grandiosity/Entitlement	8.194	.146	.955	.070	.044
Insufficient self-control	7.471	.381	.996	.018	.033
Total score (8 schemas)	8.195	.147	.963	.071	.042

*Note.* Maladaptive processes include the following cognitive distortions: Misattributing Causation; Overgeneralization; Inflammatory Labelling; Demandingness; and Catastrophic Evaluations. TG = Treatment Group; CG = Control Group; CFI = comparative fit index; RMSEA = root-mean-square error of adjustment; SRMR = square-root-mean residual.

(Appendices continue)

## Appendix C

## Change Over Time in Maladaptive and Adaptive Cognitive Processes, and in Early Maladaptive Schemas (Total Score) in Treatment and Control Groups

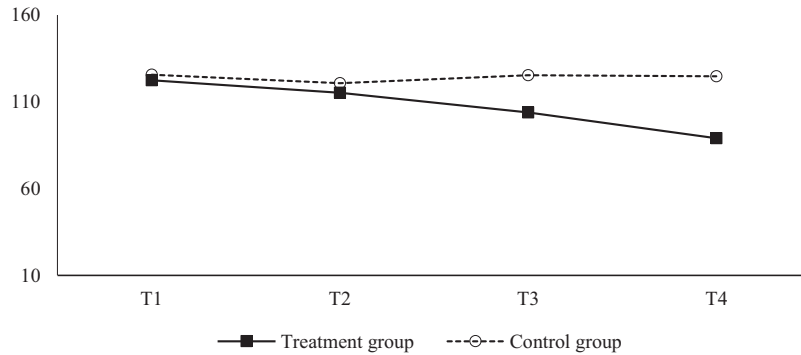


Figure C1. Change over time in maladaptive cognitive processes in treatment and control groups.

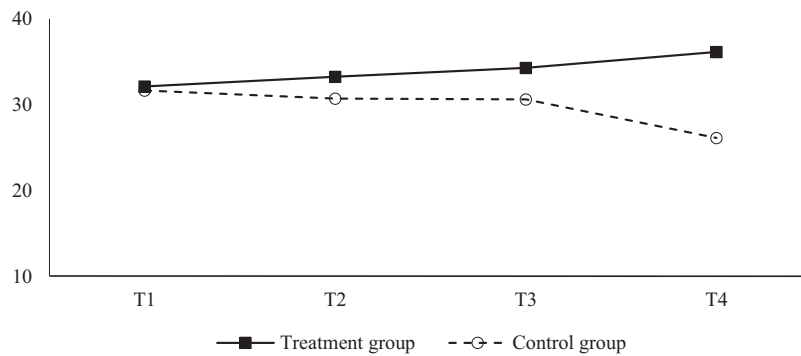


Figure C2. Change over time in adaptive cognitive processes in treatment and control groups.

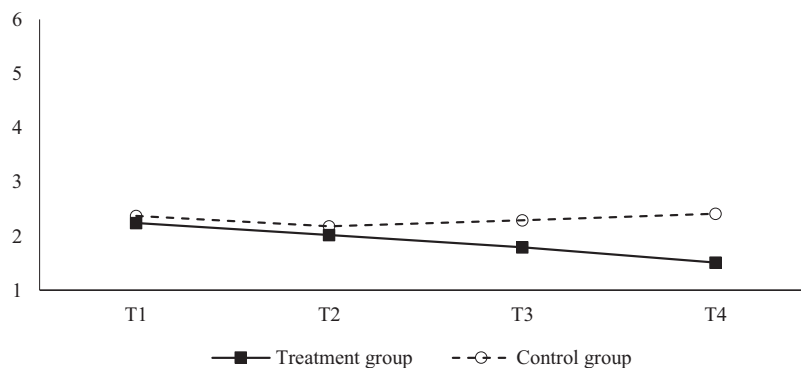


Figure C3. Change over time in early maladaptive schemas in treatment and control groups.

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