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Treating self-harm behaviors in prisons: implementation of the STEPPS program

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Abstract

Background Improving mental health within correctional facilities, specifically to address self-harm behaviors, is a crucial endeavor. However, significant challenges arise when implementing evidence-based programs within this complex setting. Despite these hurdles, the Systems Training for Emotional Predictability and Problem Solving (STEPPS) program has garnered recognition, notably in the United States, for its efficacy in tackling such issues. This study aimed to examine inmate profiles in prisons located in Catalonia, Spain, and to investigate the STEPPS program's effectiveness and implementation process.

Method Forty-one inmates participated in the study and completed measures covering self-harm behaviors, emotion regulation, impulsivity, mental health symptoms, and satisfaction with the intervention. Twenty-four professionals who implemented the STEPPS program completed satisfaction, normalization process, burnout, acceptability, appropriateness, and feasibility measures.

Results The results suggest that the STEPPS program significantly reduced symptoms of emotional dysregulation, motor impulsivity, and compulsive symptomatology among inmates. The intervention was well-received by professionals, and perceived as appropriate and feasible. The perception of feasibility decreased after implementation, likely due to contextual factors such as inmate and organization characteristics. Additionally, professionals remained committed to the implementation, dedicating time and effort to the process and engaging in thorough evaluations, without increasing their levels of burnout.

Conclusions These findings deepen the understanding of self-harm behaviors in prisons, highlighting the program STEPPS as promising approach for addressing self-harm. However, improvements in the STEPPS program are still necessary to enhance its implementation in this setting.

Trial Registration NCT06297460 (ClinicalTrials.gov, retrospectively registered, 2022/01/01).

Keywords Self-harm behaviors, Correctional facilities, Penitentiary intervention, Implementation research, STEPPS

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Background

The prevalence of self-harm behaviors among incarcerated individuals is a significant concern within correctional facilities. Research has consistently demonstrated that the prevalence of self-harm is notably higher in prison populations compared to the general population [1, 2]. An annual prevalence of around 5–6% is observed among male inmates and 20–24% among female inmates, compared to the less than 1% of self-harm incidents observed among adults in the broader community [3, 4]. This gender disparity, with higher prevalence among females, is evident in both adolescents and adults [5]. Explanations for these differences often focus not on varying emotional coping mechanisms but on higher levels of psychological distress in affected groups [6]. Beyond gender, the higher prevalence in correctional facilities highlights the unique challenges of addressing self-harm in these settings, aligning with findings specifically within the Spanish correctional system [7].

The complex interplay of factors such as mental health disorders, substance abuse, social isolation, and the stressful environment of prisons have been identified as significant contributors to the manifestation of self-harm behaviors among inmates [8–11]. Major Depressive Disorder and Borderline Personality Disorder (BPD) show a more prominent association with self-injurious behaviors, along with psychotic disorders, anxiety disorders, and substance abuse [8, 11]. Furthermore, emotional problems are highlighted as triggers for these self-injurious behaviors. In fact, in this context, the use of self-harm as a strategy for emotional regulation has been observed as the main motivation, both in men (60%) and women (67%) [12, 13].

Providing mental health care in correctional facilities has been reported to be insufficient and markedly lower than that offered to the general population [14]. This inadequacy not only exacerbates the risk of self-harm and suicide but also leads to substantial personal and economic costs, encompassing physical and health challenges, an increase in disciplinary infractions, difficulties in interpersonal relationships, and elevated levels of stigma, among other consequences [15].

Furthermore, the implementation of Evidence-Based Treatments (EBTs) to address self-harm in correctional settings is often challenging. Limited resources, staff training, and organizational barriers can significantly impact the successful deployment of evidence-based strategies [16–18]. Understanding the unique context of prisons and the perspectives of the stakeholders involved in the implementation process of these strategies is crucial for the successful adoption of interventions aimed at reducing self-harm incidents [19]. To bridge the gap between mental health and correctional institutions, the

implementation of a validated treatment adapted to the specific context is imperative [8, 20].

The psychological intervention program Systems Training for Emotional Predictability and Problem Solving (STEPPS) [21] has garnered widespread recognition for its effectiveness, in both clinical and correctional environments. Studies have demonstrated a significant improvement in symptomatology related to emotional and behavioral dysregulation, self-harming behaviors, and an overall enhancement in functioning. This improvement is accompanied by a decrease in depression levels and a high level of participant satisfaction, with these benefits persisting in the long term [21–27]. In addition, the STEPPS program in the United States (US) was considered highly suitable for implementation in prison settings [22]. This is due to its features, such as its 20-week duration, ease of application aided by a well-documented manual, and minimal training required for professionals.

The STEPPS program utilizes cognitive-behavioral elements to actively work on skills training in group therapy [22]. While originally designed for individuals with BPD, its effectiveness is linked more to the presence of emotional and behavioral dysregulation symptoms rather than a specific diagnosis [26]. The program targets these dysregulation issues directly, making it relevant for populations with self-harming behaviors, who often present with diverse diagnostic conditions. Nevertheless, emotional, and behavioral dysregulation represent the primary symptomatology, which is in line with the focus of the STEPPS program [28]. Research has shown that the STEPPS program is suitable for addressing this issue in both prison settings and among individuals who engage in self-injurious behaviors [12, 27].

Despite the availability of EBTs, such as the STEPPS program, for addressing self-harm behaviors [16–18], the know-do-gap becomes evident given how inmates are not benefiting from it [29, 30]. To address this problem and according to Implementation Research (IR) approaches, a hybrid type III implementation-effectiveness study has been conducted to implement the STEPPS program in the Penitentiary Centers (PCs) of Catalonia (Spain). Hybrid implementation-effectiveness approaches provide an alternative to the traditional research pipeline by simultaneously assessing both implementation and effectiveness outcomes [31]. This integrated approach seeks to accelerate the transition from research to practice by addressing both research questions. The approaches are classified into three types based on their emphasis on either intervention or implementation outcomes [32, 33]. Hybrid Type I focuses primarily on evaluating the effectiveness of the intervention while gathering insights into the implementation process within the setting. In contrast, Hybrid Type III places greater emphasis on

assessing the effectiveness of implementation strategies, with less focus on the intervention's outcomes. Hybrid Type II, positioned between the two, gives equal importance to both intervention effectiveness and implementation outcomes, ensuring a balanced evaluation of both aspects.

The primary objective of the study addresses implementation outcomes and processes. For this purpose, the effectiveness of the intervention and implementation outcomes, such as acceptability, appropriateness, feasibility, and satisfaction, were quantitatively analyzed. In addition, the present study aims to improve the understanding of the profile of self-harm behaviors among inmates, providing information regarding the contributing factors, psychological processes, and circumstances surrounding self-harm behaviors. Furthermore, this study represents the first implementation of the STEPPS program in PCs in Spain. By examining the real-world application of STEPPS within prisons, it offers valuable insights to shape policy and practice, ultimately enhancing the well-being of incarcerated individuals.

Method

Study design

A hybrid type III implementation-effectiveness study to address self-harm behaviors was conducted in all but one of the PCs in Catalonia. Furthermore, the remaining center has been included in the new implementation studies.

Hybrid models allow for the dual evaluation of the effectiveness of the clinical intervention and the implementation process to varying degrees [31, 34]. In this study, the hybrid type III was applied using a dual approach to assess the effectiveness of the STEPPS program in addressing self-harm behavior and implementation outcomes, barriers, and facilitators in correctional settings, placing greater emphasis on the implementation analysis. This design was chosen given that the main objective of this study is to address the applicability of the intervention in the PCs, whose effectiveness has already been widely supported by previous research [23, 25, 35]. Barriers and facilitators, such as inmate mobility within modules and the center as a barrier, or the perceived evidence supporting the intervention as a facilitator, are not presented in this work, which mainly focuses on quantitative data.

The study was approved by General Directorate of Penitentiary Affairs of Catalonia (Code = Steppscp's).

Participants and recruitment

The study participants include both patient (inmates who engage in self-harm behaviors) and the implementers (psychologist or educators of PCs).

According to the IR, the professionals participating in the implementation process of the intervention are

an additional factor in the process evaluation. Consequently, their assessment as a key influence is essential. In this case, the professionals were selected from the centers themselves, with the suitability of the profiles being assessed by the center's management team. The research team only established the criteria of a minimum of two professionals per center and the condition that at least one of them be a psychologist. These criteria for professionals were established based on the recommendations for group therapy and the program itself, which call for two implementers. Additionally, since the components of the therapy are psychological in nature, the required degree is necessary for proper implementation. The professionals in charge of the implementation were responsible for recruiting the inmates who would participate in the STEPPS program.

Patients were defined as the inmates of the PCs in Catalonia. Inclusion criteria were: (a) Male or female inmates serving sentences in a penitentiary center in Catalonia, (b) presence of self-harm behaviors, (c) sufficient understanding and command of the Spanish language to participate in the STEPPS program, (d) sufficient cognitive competence to carry out the study, and (e) mental capacity to provide informed consent.

Inmates were excluded when they met any of the following criteria: (a) Inmates serving under maximum-security measures or classified in the first level of treatment, (b) inmates with language difficulties, (c) presence of severe pathologies that hinder the study's completion, and (d) inmates with the possibility of imminent release, imminent transfers to other penitentiary centers, or pending trials.

The participants did not receive any penitentiary compensation for participating in the program, their participation was entirely voluntary.

Regarding the context of penitentiary services in Catalonia, it is important to note that this region holds executive authority over the management and organization of penitentiary centers, as established by Spanish law. Since January 1, 1984, the Department of Justice of the Government of Catalonia has been responsible for overseeing penitentiary policies, in accordance with Royal Decree 3482/1983, dated December 28.

According to data from 2023, most of the population in this setting consists of male inmates (94.0-94.3%; average age = 44.2 years), while female inmates account for 5.7-6.0% of the population (average age = 38.3 years) [36]. This study included all closed preventive and correctional centers in Catalonia, except for the Female Center in Barcelona.

Intervention

STEPPS is a program based on a cognitive-behavioral approach and skills training. The original program

consists of 20 weekly sessions, each lasting 2 h. The different sessions address each of the skills worked on in the program. The program is divided into three main components. The first component (sessions: 1–2) teaches participants to replace misconceptions about the presented issues with greater awareness of the thoughts, feelings, and behaviors that characterize them, as well as to identify their own thought patterns (i.e., cognitive filters) that drive their behaviors. The second component (sessions 3–12) teaches skills to manage the cognitive and emotional effects of the issues more effectively, such as distancing, communication, challenge, distraction, and problem-solving. The third component (sessions 13–19) teaches behavioral skills, encouraging participants to master healthy eating habits, sleep hygiene, regular exercise, leisure activities, health monitoring (such as medication adherence), self-harm prevention, and interpersonal effectiveness [22, 23].

The therapeutic objectives of the three components address [1] illness awareness [2], emotional regulation, and [3] behavioral regulation. Another characteristic of the STEPPS program is the inclusion of “system” members, including the support network identified by the participants [21, 25].

Before this study, a pilot study was conducted with a single group from one of the participating centers (*Quatre Camins*). It involved carrying out the 20 pre-established sessions. Additionally, meetings were held throughout the implementation process to document any necessary adjustments or changes.

Throughout the implementation process, it is important to consider the stakeholders’ perspective both to identify the gap and adapt the implementation

perspective [37, 38]. When planning the implementation of the intervention for the PCs, the initial adjustment involved reducing the number of modules from 20 to 16 while maintaining all effectiveness components. Essential information about the 20-module-sessions STEPPS could be found in previous literature [25]. This decrease in the number of modules was considered in the pilot study based on the infrastructure characteristics, the average time that inmates spend in a specific module, and the overlapping of basic psychoeducational content delivered in other programs. The reduction in the number of sessions does not lead to a reduction in contents, but rather a reorganization to fit the specific needs of the environment. The session reorganization was the result of joint meetings with implementers during the conducted pilot study. This collaborative approach enables maintaining the core components of the intervention while adapting it to the specific context and needs. For example, less emphasis was placed on habit-focused sessions, as a dedicated program targeting the same components was already in place.

Measures

Effectiveness outcomes

The effectiveness variables in the present study have been determined considering the psychological characteristics of the population and the program approaches (see Table 1).

Longitudinal assessment of the severity of emotional and behavioral dysregulation

(Borderline Evaluation of Severity Over Time, BEST) [21]. The BEST is a 15-item questionnaire with a 5-point Likert scale (1 = none/very

Table 1 Assessment battery

Instruments	Assessment area	Target		Assessment time	
		Patients	Professionals	Pre	Post
Effectiveness outcomes					
BEST	Intensity, thoughts, and behavioral and emotional dysregulation	X		X	X
BIS	Attentional impulsiveness, moto impulsiveness and non-planning impulsiveness.	X		X	X
SIS	Suicide attempts: present and past	X		X	
ISAS	Presence, frequency, and functionality of self-injurious behaviors.	X		X	X
BHS	Hopelessness: expectations about life, feelings about the future and loss of motivation	X		X	
Implementation outcomes					
AIM	Intervention’s acceptability.		X	X	X
IAM	Intervention’s adequacy for the context.		X	X	X
FIM	Intervention’s feasibility.		X	X	X
NoMAD	Normalization process of the intervention in the system.		X		X
CBI	Personal burnout, work-related burnout, and users-related burnout		X	X	X
CSQ	Implementers’ and patients’ satisfaction with the intervention.	X	X		X

AIM=Acceptability of Intervention Measure; BEST=Borderline Evaluation of Severity Over the Time; BHS=Beck Hopeless Scale; BIS=Barratt Impulsiveness Scale; BSI=Brief Symptom Inventory CBI=Copenhagen Burnout Inventory; CSQ=Client Satisfaction Questionnaire; FIM=Feasibility of Intervention Measure; IAM=Intervention Appropriateness Measure; ISAS=Inventory of Statements About Self-injury; NoMAD=Normalization Measure Development; SIS=Suicide Intent Scale

mild; 5 = extremely) that assesses three areas: the intensity of thoughts and emotions, and negative and positive behaviors. This questionnaire was developed together with the STEPPS program to assess the severity of symptoms over time, as well as treatment effectiveness. This has proven to be highly valid, reliable, and internally consistent (Cronbach's alpha = 0.86–0.92) and sensitive to change in a period of just 4 weeks [25]. The total score of BEST does not have a cutoff point; higher scores indicate greater emotional and behavioral dysregulation.

Barratt impulsiveness scale (BIS) [39] The BIS is a self-report questionnaire designed to assess impulsiveness in different areas. It consists of 30 items that are scored on a 4-point scale (from rarely or never [1] to always or almost always [4]). The scale measures three aspects of impulsiveness: Attentional Impulsiveness, Motor Impulsiveness, and Non-Planning Impulsiveness. The scale has been found to be internally consistent and has potential clinical utility for measuring impulsiveness among selected patients but also within inmate populations [40]. Furthermore, the Spanish validation has shown high psychometric properties (Cronbach's alpha = 0.87) [41].

Beck suicidal intent scale (SIS) [42] This questionnaire assesses the characteristics and likelihood of a suicide attempt in the present and the past. It addresses circumstances during the attempt, attitudes towards life and death, thoughts before, during, and after the attempt, and substance use. The questionnaire consists of 20 items rated on a 3-point scale (0 to 2). The scale exhibits excellent psychometric properties, with high reliability (Cronbach's alpha = 0.89) and excellent validity and discriminative ability [43]. For interpretation, if items 4 and 5 are scored as 0, it is established that there is no suicide risk. In the case of scoring on these items, the score will be interpreted without establishing a cutoff point, indicating that a higher score signifies a greater risk of suicide.

Inventory of statements about self-injury (ISAS) [44] The ISAS is a questionnaire that explores self-injurious behaviors and is divided into two sections. The first section evaluates the presence and frequency of 13 different types of self-injuries, and the second section assesses the functionality of self-injurious behaviors on a 3-point Likert scale. This questionnaire assesses self-injurious behaviors throughout the treatment and enables drawing conclusions about the program's effectiveness in addressing these behaviors. The ISAS has been recently validated in Spanish, showing good psychometric properties with good internal consistency at interpersonal and intrapersonal factors (Cronbach's alpha = 0.87 and 0.89 respectively) [45].

Beck hopeless scale (BHS) [46] The BHS is a 20-item true/false scale that assesses individuals' feelings of hopelessness. In this case, it evaluates three aspects of hopelessness: (1) A person's expectations about life; (2) Their feelings about the future, and (3) The loss of motivation. The instrument has been validated in Spanish, showing excellent internal consistency (Kuder-Richardson-20 coefficient = 0.88) [47]. The scale indicates greater severity with a higher score, establishing the following levels of hopelessness based on the following cutoff points: 0–3: none or minimal, 4–8 = mild, 9–14 = moderate, and 15–20 = severe.

Implementation outcomes

The implementation variables are essential for evaluating the implementation process of the intervention in the penitentiary centers of Catalonia. Professionals have been assessed in the following aspects:

A battery of three scales including **Acceptability of Intervention Measure (AIM)**, **Intervention Appropriateness Measurement (IAM)** **Feasibility of Intervention Measure (FIM)** [48]. These measures constitute a set of three scales: AIM, IAM, and FIM. The AIM assesses acceptability based on stakeholders' perceptions of the intervention's utility or satisfaction across four items on a 5-point Likert scale. This scale has demonstrated robust psychometric properties, with good internal consistency (Cronbach's alpha = 0.85) and a test-retest reliability coefficient of 0.83. The IAM comprises four 5-point Likert scale items designed to explore the adequacy of the intervention, considering its perceived relevance or compatibility in the given context. IAM exhibits excellent internal consistency (Cronbach's alpha = 0.91) and good test-retest reliability coefficients (0.87). The FIM encompasses four items designed to measure the feasibility of the intervention, indicating the extent to which the intervention can be successfully executed within the system, using a 5-point Likert scale. In terms of psychometric properties, the FIM demonstrates high internal consistency (Cronbach's alpha = 0.89) and robust test-retest reliability (Coefficient = 0.88). These scales lack a predefined cutoff point for interpretation; a higher score signifies a heightened perception of acceptability, appropriateness, and feasibility.

Normalization measure development (NoMAD) [49, 50] The NoMAD questionnaire is a brief self-report instrument based on the Normalization Process Theory (NPT), designed to assess the progress toward normalization over time in an implementation project. It consists of 20 items on a 5-point Likert scale (from 1 = completely agree to 5 = completely disagree) that address four subscales: Coherence (CO), Cognitive Participation (CP), Cognitive Allocation (CA), and Reflexive Monitoring

(RM). The overall scale present high internal consistency with a Cronbach's alpha of 0.81. No cutoff point was established by authors, however they indicated that higher scores should be interpreted as indicating higher level of normalization of the implemented innovation.

Copenhagen burnout inventory (CBI) [50] Although not a direct measure of implementation variables, the CBI has been considered due to its potential influence on the implementation process. The CBI is a 19-item questionnaire on a 5-point Likert scale that measures burnout syndrome, differentiating three sub-dimensions: personal burnout, work-related burnout, and user-related burnout. The questionnaire has shown good psychometric properties in all three subscales with high consistency in the personal (Cronbach's alpha = 0.9), work-related (Cronbach's alpha = 0.83), and user-related (Cronbach's alpha = 0.82) subscales [52].

Client satisfaction questionnaire (CSQ) [53, 54] The CSQ is an eight-item questionnaire that assesses participants' overall satisfaction with the intervention received on a 4-point scale. It has proven to be a reliable tool with good internal consistency (Cronbach's alpha = 0.89) in the Spanish validation [55]. No cutoff point has been established; instead, higher scores are indicative of a higher degree of satisfaction.

Procedure

The project's implementation followed several key steps (See Fig. 1), as outlined below:

Beginning of collaboration

The coordination and collaboration between the Department of Justice of Catalonia and Jaume I University begins. The Department of Justice contacted the (blinded for peer review) laboratory upon detecting the need to address self-harm behaviors in PCs.

Pilot testing at *Quatre Camins* penitentiary center

Initiating the project involved collaborative efforts with the *Quatre Camins* Penitentiary Center. A single-case pilot study was undertaken to preliminarily assess the program's feasibility. Numerous meetings were convened to address complications related to determining which aspects to assess and how to implement the program,, including considerations such as timing, session duration, and the modules of the center to be included.

Initial adaptation of the STEPPS manual

Drawing from the insights of implementers at the *Quatre Camins* Penitentiary Center and collaborative meetings, the STEPPS manual was first adapted to meet the specific needs of the penitentiary context. This initial adjustment resulted in a content reduction to 16 sessions (from the original 20 sessions), with a heightened emphasis on addressing self-destructive behaviors.

Training professionals in self-harm and implementing the STEPPS manual

Following the initial adaptation, a four-day training session was held for all professionals of all centers in charge of the implementation. The training was conducted by two researchers who are specialists in the STEPPS program, with experience in its application within public services in Spain. The training centered on

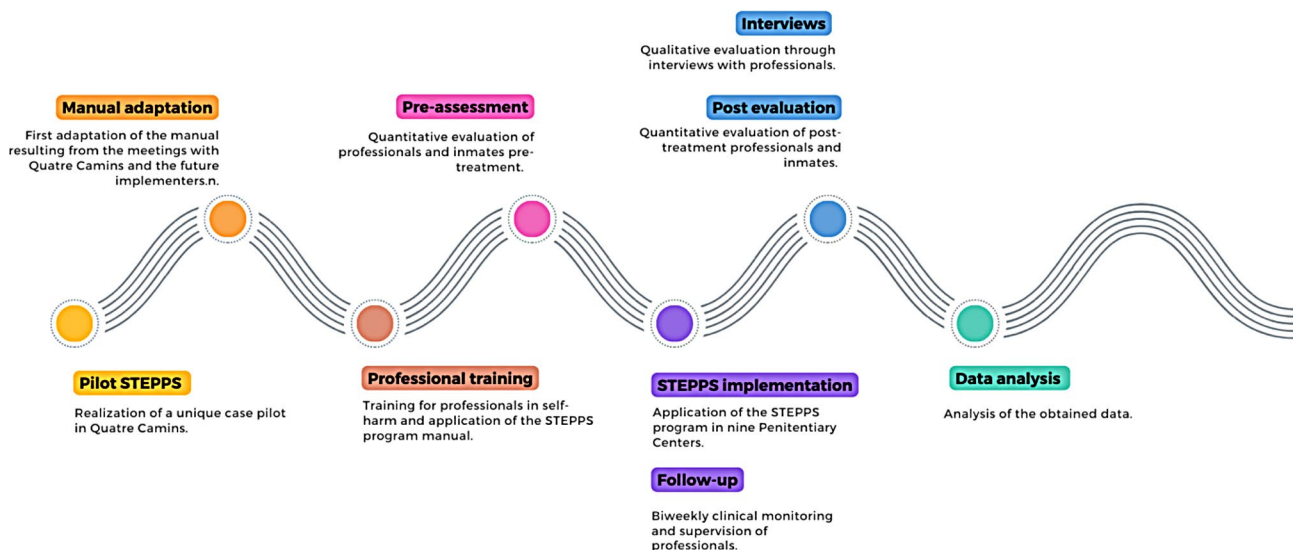


Fig. 1 Implementation process

the initial adaptation of the manual. In this phase, the pre-assessment of professionals was also conducted.

Manual implementation in penitentiary centers After selecting participants based on established inclusion and exclusion criteria, the implementation was carried out in nine penitentiary centers in Catalonia.

Biweekly supervision during implementation Regular biweekly supervision by main researchers (RL-C and

AG-P) ensured the reliability of implementation, provided support to implementers, and identified necessary adaptations during the implementation process.

Quantitative and qualitative evaluation of professionals A thorough evaluation of the professionals implementing the intervention was conducted, utilizing both quantitative and qualitative methods to measure performance and gather experiences and feedback. In this article only implementation outcomes are presented. The assessment was conducted when all groups have finished.

Table 2 Self-injury characteristics of the inmate sample

	Total N	% (n)
Self-injury behaviors		
Banging/hitting self	39	76.9 (n=30)
Biting	40	27.5 (n=11)
Burning	40	32.5 (n=13)
Carving	33	69.7 (n=23)
Cutting	40	90 (n=36)
Wound picking	40	52.5 (n=21)
Needle-sticking	40	12.5 (n=5)
Pitching	40	22.5 (n=9)
Hair pulling	39	28.2 (n=11)
Rubbing skin against rough surfaces	39	25.6 (n=10)
Severe scratching	39	33.3 (n=13)
Swallowing chemicals	40	55 (n=22)
Age of onset		
9–12	38	21.1 (n=8)
13–17	38	26.3 (n=10)
18–21	38	28.9 (n=11)
22–30	38	15.8 (n=6)
31–55	38	7.9 (n=3)
Experience of pain during self-injury		
Yes	40	29.3 (n=12)
Sometimes	40	19.5 (n=8)
No	40	48.8 (n=20)
Self-harm alone		
Yes	40	63.4 (n=26)
Sometimes	40	26.8 (n=11)
No	40	7.3 (n=3)
Time between the urge to self-injure		
Less than 1 h	40	75.6 (n=31)
1–3 h	40	9.8 (n=4)
3–6 h	40	4.9 (n=2)
6–12 h	40	2.4 (n=1)
Desire to stop self-injuring		
Yes	40	87.8 (n=36)
No	40	2.4 (n=1)
Not sure	40	7.3 (n=3)
Suicidal ideation (Yes)		
	39	47.5 (n=17)
Hopelessness		
None-minimal	40	30 (n=12)
Mild	40	20 (n=8)
Moderate	40	37.5 (n=15)
Severe	40	12.5 (n=5)

Evaluation of patients' symptomatology The symptomatology of patients receiving the intervention was assessed to measure changes and determine the effectiveness of the STEPPS program. Assessment was conducted immediately after the program completion. Only short-term assessments have been conducted as required from CS of Catalonia, no agreement has been established for medium or long-term assessments.

Data analysis

The IBM SPSS Statistics v.28 was used to conduct all the statistical analyses. Descriptive analyses were performed to describe the sample characteristics and explore the profile of self-harm behaviors among the inmates of PCs in Catalonia (Spain). As our sample was small (<50 samples), the Shapiro-Wilk test was used to decide whether the sample fit with a normal distribution (Mishra et al., 2019). Given the lack of normality, the Wilcoxon signed-rank test was used instead of the t-test to compare the pre-and post-intervention values on all the effectiveness and implementation outcomes. Z and p values are reported for each analysis.

Results

Inmate profile

The sample for this study consists of 11 women (26.8%) and 30 men (73.2%) from 8 penitentiary centers in Catalonia. The mean age was 32.62 (SD=10.79) years, ranging from 21 to 63 years. The majority of the sample was Spanish (n=23, 56.1%) or Moroccan (n=9, 22%), followed by Romanian (n=2, 4.9%), Brazilian (n=2, 4.9%), Belgian (n=1, 2.4%), Chilean (n=1, 2.4%), and Nigerian (n=1, 2.4%). Two participants (4.5%) did not respond to the question regarding their nationality. Regarding the number of sessions completed by each participant, information was only available for 32 inmates. Specifically, 18 inmates were able to complete 7 or more sessions, and 9 inmates completed the entire program. Fourteen inmates completed less than 7 sessions, and 2 of them did not start the program.

The forms of self-injury carried out by most inmates were self-cutting, self-carving, and self-hitting (Table 2).

Specifically, 90% of them reported having performed self-cutting, 69.7% self-carving, and 76.9% self-hitting as a form of self-injury at some time in their lives. Generally, the time that elapses from the moment they feel the need to self-injure until they act is less than 1 h (75.6%). It is also worth noting that during the evaluation session, many of the inmates specified a shorter period (“not even minutes”, “seconds”). Also, most inmates reported that they do it when they are alone (63.4%) and 50% reported not feeling pain.

Regarding the self-injury function, affect regulation, anti-dissociation, self-punishment, and communicating discomfort showed the highest values (Fig. 2). In addition, most inmates expressed a desire to stop self-injury behavior (87.8%) compared to a smaller proportion who were ambivalent (7.3%) or expressed a desire to continue engaging in these behaviors (2.4%). Importantly, 70% of inmates participating in this study reported mild to severe symptoms of hopelessness, and 47.5% showed suicidal ideation.

Professional characteristics

A total of 24 professionals from 9 different penitentiary centers across Catalonia participated in this study. The mean age of the participants was 46 years ($SD = 6.9$), with the majority being women (70.8%, $n = 17$). Most (87.5%) were psychologists ($n = 21$), 8.3% ($n = 2$) were social workers ($n = 2$) and 4.2% ($n = 1$) were head of specialized care programs. On average, the professionals had 15.26 ($SD = 11.13$) years of experience working in penitentiary centers, showing a diverse range of expertise. The least experienced professional had 2 years of experience, while the most experienced had 40 years.

Effectiveness outcomes

As shown in Table 3, inmates exhibited a significant decrease in their BEST scores from the baseline to the post-treatment assessment, indicating an improvement in emotional and behavioral dysregulation. In addition, they showed a significant decrease in the motor impulsivity subscale and obsessive-compulsive symptoms (BSI).

Implementation outcomes

In terms of satisfaction with the intervention, inmates obtained a mean score of 25.4 ($SD = 4.27$) on the CSQ, indicating a high level of satisfaction with the intervention. Table 4 shows the satisfaction levels of the professionals regarding the support provided by the external researchers and the STEPPS program, along with the interest they have in continuing with the implementation of STEPPS in the future. Overall, professional's satisfaction was good, being the higher level of satisfaction obtained for the support provided by the stakeholders.

Additionally, evaluations of appropriateness, acceptability and feasibility showed high ratings during both the baseline and in the post-intervention assessment (Table 4). While acceptability and appropriateness did not reveal significant differences between the baseline and post-intervention, there was a significant decrease in terms of feasibility from the baseline to the post-intervention, revealing a decrease in the professional's perception of feasibility over the course of the study. In this line, this study found middle values on the four constructs of the NoMAD (coherence, cognitive participation, collective action, and reflexive monitoring), suggesting an appropriate level of normalization, which reflects the integration of STEPPS as a routine service within implementation context.

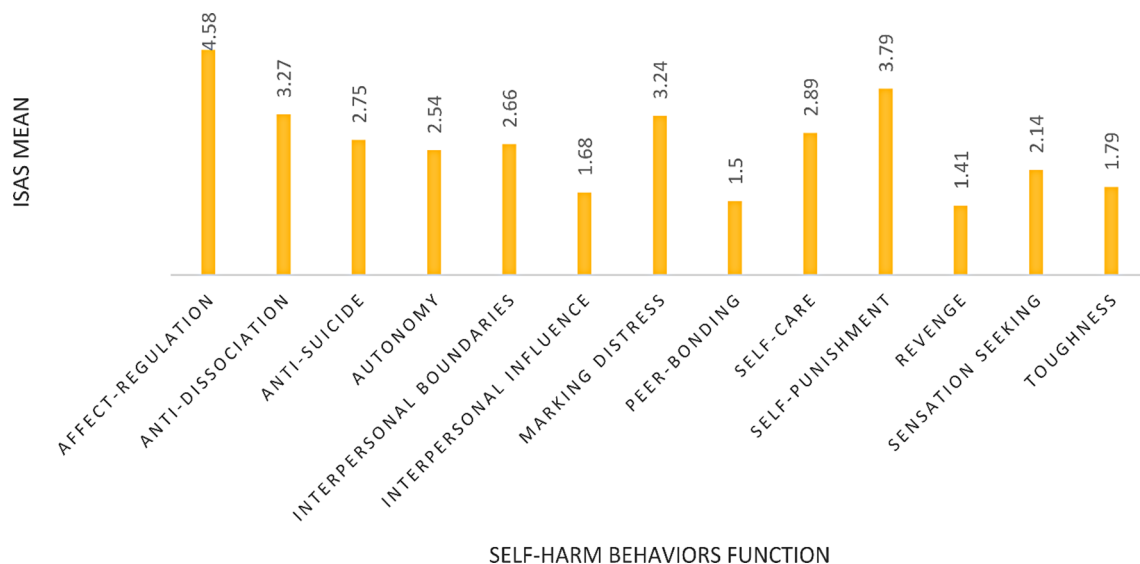


Fig. 2 Scores on the ISAS for the Self-harm functions subscale

Table 3 Wilcoxon signed Rank test for effectiveness outcomes before and after the intervention

	<i>N</i>	Baseline Md	Post-intervention Md	<i>Z</i>	Asymp Sig (2-Tailed)
BEST	9	36	24	-2.67 ^a	0.008
BIS					
Cognitive	11	22.00	23.00	-0.89 ^a	0.370
Motor	11	28.00	26.00	-2.05 ^a	0.041
Non-planning	11	30.00	27.27	-0.93 ^a	0.350
BSI					
Depression	10	2.5	3.62	-1.94	0.053
Somatization	11	1.64	1	-1.52	0.130
Paranoid ideation	11	2.5	1.78	-1.68	0.092
Obsession-compulsion	11	1.9	1.7	-2.04	0.041
Phobic anxiety	11	0.45	0.50	-0.18	0.868
Hostility/Aggressivity	11	2.5	1.81	-1.13	0.260

^aBased on positive ranks: BEST: Borderline Evaluation of Severity Over Time; BIS: Barratt Impulsiveness Scale; BSI: Brief Symptom Inventory

Table 4 Implementation outcomes reported by the professionals

	Baseline Mean (SD)	Baseline Md	Post-Intervention Mean (SD)	Post-Intervention Md	<i>Z</i>	Asymp Sig (2-Tailed)
Satisfaction (CSQ)						
With external researchers	-	-	4.47(0.8)	5.00	-	-
With the STEPPs program	-	-	3.82(0.95)	4.00	-	-
Interest in implementing STEPPs in the future	-	-	3.94(1.14)	4.00	-	-
Normalization (NoMAD)						
Coherence	-	-	1.94(0.51)	2.00	-	-
Cognitive Participation	-	-	1.56(0.55)	1.50	-	-
Collective Action	--	-	2.68(1.03)	2.29	-	-
Reflexive Monitoring	-	-	1.96(0.66)	2.10	-	-
Burnout (CBI)						
Personal related	48.61(14.02)	45.83	54.17(13.53)	52.08	-1.75 ^a	0.081
Work related	36.01(15.63)	30.36	36.60(12.93)	32.14	-0.27 ^a	0.788
Client related	32.99(9.31)	33.33	34.72(10.41)	31.25	-0.72 ^a	0.470
Acceptability (AIM)	4.40 (0.50)	4.00	4.27(0.61)	4.25	-0.72 ^a	0.474
Appropriateness (IAM)	4.28(0.57)	4.12	4.16(0.61)	4.25	-0.66 ^a	0.509
Feasibility (FIM)	3.75(0.72)	3.50	3.2(0.92)	2.88	-2.05 ^a	0.041

^aBased on positive ranks

AIM = Acceptability of Intervention Measure; CBI = Copenhagen Burnout Inventory; CSQ = Client Satisfaction Questionnaire; FIM = Feasibility of Intervention Measure; IAM = Intervention Appropriateness Measure; NoMAD = Normalization Measure Development;

Discussion

This study aimed to explore Non-Suicidal Self-Injury behaviors within a sample of inmates in Catalonia (Spain) and to test the efficacy of the STEPPs intervention, along with implementation outcomes such as satisfaction, appropriateness, acceptability, and feasibility, considering plausible changes from baseline to post-intervention.

The acquired data has significantly enhanced the understanding of self-harming behaviors within the prison population, particularly in the Catalonian context. The outlined profile aligns with existing literature, where self-cutting emerges as the predominant form of these behaviors, primarily serving as a strategy for emotional regulation. The typology of self-harming behaviors may

be influenced by the means that are more accessible, with self-cutting and self-hitting being more common due to their immediate availability. Additionally, the impulsivity of these behaviors also plays a significant role [56, 57].

Within the data, a noticeable pattern emerges, indicating a strong desire to cease self-harming behaviors. However, short-term reinforcement, powerful impulses, and, in certain cases, the absence of pain contribute to the persistence of these maladaptive emotional regulation strategies [8, 58]. By acknowledging that self-harm fulfills different functions, we can implement targeted interventions that address the underlying needs.

Notably, the STEPPs program appears well-suited to tackle these needs, as evidenced by the results in this

study. Specifically, a significant decrease in emotional and behavioral dysregulation was shown, in line with a decrease in impulsive motor actions and a decline in compulsive symptomatology exhibited among the inmates. These results add to the evidence of the efficacy of the STEPPS program in addressing key components of dysregulation and impulsivity.

Implementation outcomes indicate that professionals accepted the intervention and perceived it as appropriate. Furthermore, results from the NoMAD assessment showed that the STEPPS program was quite embedded and integrated in the professional routine. However, feasibility perception decreased over the phases of the study. This decrease may be attributed to professionals becoming aware of the difficulties that the implementation may have during the implementation process. Factors such as impulsivity or instability traits, high rates of dual diagnosis in the population, or contextual factors such as mobility within modules and centers, conflicts with other activities, and instances of punitive isolation could have become apparent. This may have led professionals to perceive the process as more challenging than they initially thought.

These complications indicate the need to conduct specific adaptations for this setting. Some of these adaptations were already conducted during the study based on the follow-up meetings during the implementation, such as transmitting the content in a more dynamic way or filling out the BEST at the beginning of the session verbally instead of written. As changes were introduced to the program, professionals demonstrated a strong willingness and ability to adapt to the modifications. Additionally, it is worth noting that significant satisfaction levels were recorded regarding collaboration with the (blinded for peer review) team and with the STEPPS program. These findings highlight the importance of collaboration between professionals and the research team, as well as the positive perception of the intervention, which could inform future improvements. Despite challenges and the need for adaptations, professionals expressed strong interest in future implementation.

All in all, our findings suggest an improvement in emotional and behavioral regulation strategies, as well as a decrease in impulsivity levels. Additionally, the program was well-valued by professionals and inmates. These results are congruent in previous studies of STEPPS programs in PS in US [23, 27]. However, it is emphasized that there is a need to explore the context in detail to overcome observed difficulties and generate specific adaptations. This is essential and a key aspect of this study, to address the applicability of a needed intervention in an attentional setting with the personal, contextual, and economical resources to promote its scalability (Zomahoun et al., 2019).

In fact, the lack of controllability was often a challenge during the development of the study, which led to several limitations. These challenges ranged from incomplete questionnaires to difficulties in collecting pre- and post-intervention data. To illustrate these difficulties, some questionnaires arrived incomplete and disordered by mail, and in some cases, content which was unrelated to the questionnaires but belonged to parts of the study manual was received. Additionally, during the design phase of the study the plan was for professionals to inform about the number of self-harm behaviors conducted during the pre- and post-intervention phases. However, these numbers were not reported by professionals adequately. Also, some post-assessments were not conducted due to the mobility of the inmates. Despite some inmates meeting this condition, questionnaires for some of these individuals were not available. The literature shows us that this is a common contextual barrier in research assessment [18].

The absence of a measurement of implementation fidelity was also a limitation of this study. It would be valuable to incorporate mechanisms to assess and ensure consistency in the program's application. Lastly, the significant loss of the sample and questionnaire completion pose a potential limitation in the generalizability of the results. The study sample was diverse, encompassing various races, ages, and genders. However, no specific analyses were conducted in this regard due to the limited sample size. While previous literature did not reveal differences related to demographic conditions (Black et al., 2018), it is crucial to acknowledge this aspect for future studies and conduct dedicated analyses to validate these findings. Another limitation associated with the chosen approach is the absence of a control group, which, while not impeding the interpretation of the results, necessitates careful consideration of potential changes attributable to extraneous factors. Even with these limitations, the findings offer valuable insights into self-harming behaviors in prisons. However, it is imperative that future research addresses these limitations for a more comprehensive and accurate understanding of the results. Future research should focus on designing and testing implementation facilitators, fidelity levels, and developing the definitive adaptation of the STEPPS program for use in Catalonia's prisons.

In conclusion, this study represents a significant step towards understanding the challenges and finding solutions to implementing an intervention program in Catalonia's correctional facilities. The combination of understanding the phenomenon while assessing the intervention and taking into consideration professionals' perspective provides a comprehensive picture of the program's effectiveness and implementation process in Catalonia's PCs. Ultimately, these results have significant

practical implications for addressing mental health in specific attentional contexts, specifically in correctional settings.

Acknowledgements

We would like to express our gratitude to all professionals who have contributed to the implementation of the STEPPS program across all centers, as well as to the General Directorate of Penitentiary Affairs for making this advancement possible. Additionally, we are grateful for the contribution of all inmates who chose to participate and engage in self-improvement efforts to enhance their quality of life.

Author contributions

X. B-H and B. F oversaw the recruitment, training, and management of both the centers and professionals involved. R. L-C and AG-P conducted the professionals' training and provided supervision during the program implementation. R. L-C and IJ jointly manage the data. I. J conducted data analysis and interpretation. R. L-C formatted the manuscript to journal specifications, and I. J handled the submission. All authors reviewed and approved the final manuscript.

Funding

[1] R.L.-C. is holder of PhD grant from "Conselleria de Innovación, Universidades, Ciencia y Sociedad Digital, Generalitat Valencia (Spain). Subvenciones para la contratación de personal investigador de carácter predoctoral (ACIF/2020)". Reference: ACIF/2020/332 [2]. Agreement University of Jaume I (Castelló, Spain) - "GENERALITAT DE CATALUNYA - CENTRE FOR LEGAL STUDIES AND SPECIALIZED TRAINING. Adaptation of the Systems Training for Emotional Predictability & Problem Solving (STEPPS) program for group treatment of emotional dysregulation and self-injurious behaviors in the Penitentiary Centers of Catalonia." [3] Ministerio de Ciencia, Innovación y Universidades (Spain). Instituto de Salud Carlos III. Convocatoria de Ayudas a la acción estratégica de salud. Reference: P19/00723.

Data availability

Materials used for STEPPS implementation cannot be shared because of copyright restrictions. All data and scripts are publicly available (<https://osf.io/quhzv/>).

Declarations

Ethics approval and consent to participate

The study was approved by General Directorate of Penitentiary Affairs of Catalonia (Code = Steppscps) (1 June 2022). The consent of participation was given by all participants. The study has been conducted following the guidelines of the Helsinki and Tokyo Declaration.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Received: 26 September 2024 / Accepted: 31 December 2024

Published online: 16 January 2025

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