

Physical activity and wellbeing in prisoners: a scoping review

Fabrizio Liguori and Patrizia Calella

Abstract

Purpose – This scoping review aims to evaluate the impact of physical activity interventions on the well-being of incarcerated individuals. It seeks to provide a comprehensive overview of existing research on various forms of physical activity, including structured exercise programs, yoga and mindfulness, and their effects on both mental and physical health within prison populations.

Design/methodology/approach – A scoping review was conducted by searching Google Scholar, PubMed and Web of Science in June 2024. Keywords used included “physical activity,” “exercise,” “fitness,” “sports,” “prisoners,” “inmates,” “incarcerated individuals,” “well-being,” “mental health,” “physical health,” “psychological well-being” and “emotional well-being.” After screening 1,736 potential articles, 54 relevant studies were selected. These included structured exercise programs, yoga/mindfulness programs and evaluations of physical activity levels. Two authors independently reviewed and selected studies based on predefined inclusion criteria, ensuring a comprehensive overview of the literature on physical activity interventions in prison settings.

Findings – The review identified 12 relevant studies, revealing that physical activity interventions, including structured exercise programs, yoga and mindfulness, positively impact the psychological and physical well-being of incarcerated individuals. Consistent improvements were noted in mental health outcomes, such as reduced depression and anxiety, and enhanced physical health indicators, including lower body mass index and increased fitness levels. The findings underscore the necessity for age- and gender-specific interventions to address the unique health challenges faced by different inmate demographics, highlighting the importance of incorporating diverse and culturally relevant exercise programs in prisons.

Originality/value – This review uniquely synthesizes the impact of various physical activity interventions on the well-being of incarcerated individuals, emphasizing the necessity for tailored, culturally relevant programs. Notably, no previous review has comprehensively analyzed this aspect. By comparing diverse types of interventions, it provides comprehensive insights into the benefits of structured exercise, yoga and mindfulness in prison settings. This work highlights the importance of implementing physical activity in various forms, especially for female inmates, to enhance health and well-being. It offers valuable guidance for developing effective rehabilitation strategies in correctional facilities.

Keywords Health in prison, Health promotion, Mental health, Prisoners, Correctional health care

Paper type Literature review

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The context of prisons

As for the World Health Organization (WHO) guidelines, health is not merely the absence of disease or infirmity but rather a state of complete physical, mental and social well-being ([International Health Conference, 2022](#)). This comprehensive definition of health encompasses both objective health indicators, such as maintaining normal blood pressure and optimal blood values, as well as subjective health perception and social health. Moreover, the Pan American Health Organization (PAHO) in 2022 has also emphasized that social health includes psychosocial and behavioral factors [[Pan American Health Organization \(PAHO\), 2022](#)].

The social health of individuals is profoundly influenced by their relationships and interactions with others, within the prison context, inmates face various psychosocial

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stressors during their confinement, but they lack the support of family and friends to cope with these challenges. As a result, prisoners must establish new connections and integrate socially within the prison “community” to enhance their ability to cope with the stressors they encounter (De Viggiani, 2006).

On the other hand, subjective health pertains to an individual's own perception of their health and their level of satisfaction with their overall well-being (Downward *et al.*, 2016). It is a subjective assessment that takes into account an individual's feelings, thoughts and beliefs about their health status and how content they are with it.

The health and well-being of incarcerated individuals are increasingly recognized as critical public health issues. Prison populations worldwide face significant health challenges, exacerbated by factors such as overcrowding, limited access to health care and high rates of mental illness and chronic diseases. According to the WHO, health is defined as a state of complete physical, mental and social well-being, emphasizing the need for comprehensive health interventions in prison settings.

Incarcerated individuals exhibit a higher prevalence of mental health needs compared to the general population, encompassing various conditions such as anxiety, depression, substance dependency and even more severe disorders like schizophrenia (Fazel and Seewald, 2012). These mental health needs tend to occur at the same time, resulting in a complex array of multiple, simultaneous problems experienced by inmates (Baranyi *et al.*, 2022).

Moreover, those entering prison are more likely to originate from communities characterized by multiple levels of deprivation and have faced interpersonal victimization (Caravaca-Sánchez *et al.*, 2022). The imprisonment itself can have detrimental effects on an individual's mental health, with the remand period being particularly recognized as a time of heightened vulnerability (Zhong *et al.*, 2021). Incarcerated individuals have a significantly higher prevalence of mental health disorders compared to the general population. Studies indicate that approximately 37% of prisoners worldwide suffer from major depressive disorder, and about 13% experience psychotic disorders (Fazel and Seewald, 2012).

Inmates are affected not only by mental disorders but also by physical health problems, such as infectious diseases, chronic viral hepatitis, chronic diseases, injuries and dermatological and sensory problems (Stasi *et al.*, 2016).

Infectious diseases pose a significant public health challenge in prisons worldwide, with prevalence rates substantially higher than those in the general population. Prisoners are particularly vulnerable to infections such as hepatitis C, tuberculosis and Human Immunodeficiency Virus due to overcrowded conditions, poor hygiene, limited access to healthcare and the frequent presence of high-risk behaviors, such as intravenous drug use (Kinner and Young, 2018). Hepatitis C is one of the most prevalent infections among incarcerated individuals, with prevalence rates ranging from 15% to 40% in Europe and North America, compared to about 1% to 2% in the general population (Larney *et al.*, 2013).

The decline in physical activity due to continual confinement, limited access to physical labor and inadequate dietary practices represent significant contributors to the deterioration of prisoners' well-being. Among inmates, psychiatric and digestive disorders emerge as prevalent health concerns (Voller *et al.*, 2016). Additionally, a heightened susceptibility to diet-associated ailments such as overweight, obesity, diabetes, atherosclerosis and arterial hypertension is evident (Abdalbary *et al.*, 2022; Simeni Njonnou *et al.*, 2020). The emergence of such conditions is influenced by various factors beyond mere physical inactivity or suboptimal nutrition, including substance abuse, alcohol consumption and smoking (Fazel and Baillargeon, 2011).

Incarcerated individuals often exhibit higher rates of noncommunicable diseases compared to the general population due to a combination of preexisting health conditions, lifestyle factors and the prison environment. Hypertension, diabetes and cardiovascular diseases are particularly common. For instance, a study by Herbert *et al.* found that the prevalence of hypertension

among prisoners ranged from 15% to 20%, higher than the general population's prevalence of approximately 10% (Herbert *et al.*, 2012). Diabetes is also a concern, with prevalence rates in prisons reported to be between 5% and 7%, which is notably higher than national averages. Additionally, obesity and related metabolic disorders are prevalent, exacerbated by limited physical activity and unhealthy diets typical of prison settings (Bondolfi *et al.*, 2020).

Physical inactivity and sedentary behavior are prevalent issues in prison populations, significantly impacting the health and well-being of incarcerated individuals. Scientific studies indicate that the majority of prisoners do not meet the WHO's recommended physical activity levels, with more than 75% of inmates leading predominantly sedentary lifestyles. A study by Cashin *et al.* (2008) found that structured physical activity programs are limited in many correctional facilities, resulting in decreased opportunities for inmates to engage in regular exercise.

Recognizing the urgent need to address health disparities in prisons, the WHO has called for the implementation of health promotion and disease prevention programs within correctional facilities. The WHO's Health in Prisons Program provides guidance and support to member states in developing effective health interventions that include promoting physical activity as a crucial component.

Several countries have implemented innovative physical activity programs in their prison systems: Norway integrates physical activity into its rehabilitation programs. The country emphasizes outdoor activities and sports, which are considered essential for improving physical and mental health and reducing recidivism (Muller and Bukten, 2019). The UK has developed various health and fitness initiatives such as "Parkrun in Prisons," which involves organized running events, have been shown to enhance mental well-being and foster a sense of community among prisoners (Campana *et al.*, 2023). Furthermore, recently a research team developed an international consensus statement to guide the design, delivery and evaluation of sport-based interventions in prisons, aiming to enhance the social, psychological and physical well-being of incarcerated individuals by recommending evidence-based, inclusive and sustainable programs and encouraging ongoing research and policy integration (Murray *et al.*, 2024).

To optimize health outcomes for incarcerated populations, it is essential to consider both individual predisposing factors and the potential impacts of imprisonment on mental and physical well-being. Physical activity interventions can play a crucial role in addressing these issues. Regular physical activity has been shown to improve physical health, reduce the prevalence of chronic diseases, enhance mental well-being and foster social connections.

Despite these efforts, there is still limited research on the specific impact of physical activity interventions on prisoners' well-being, especially in diverse cultural and demographic contexts. This scoping review aims to evaluate the existing literature on physical activity interventions in prisons, assess their effects on mental and physical health and identify gaps in current knowledge. By doing so, this study seeks to provide insights into effective strategies for promoting the well-being of incarcerated individuals and support the development of targeted interventions that address the unique challenges faced by different inmate populations.

Methods

The literature search for this scoping review was conducted across three databases:

1. Google Scholar;
2. PubMed; and
3. Web of Science.

This search was performed in June 2024. The search strategy included a set of keywords tailored to investigate the impact of physical activity interventions on the well-being of incarcerated individuals. The keywords used were: (“physical activity” OR “exercise” OR “fitness” OR “sports”) AND (“prisoners” OR “inmates” OR “incarcerated individuals”) AND (“well-being” OR “mental health” OR “physical health” OR “psychological well-being” OR “emotional well-being”).

Additionally, the references of the included studies and previous relevant reviews were manually reviewed for inclusion. The titles and abstracts of all identified articles were manually checked to determine their eligibility.

Two authors independently selected articles that met the inclusion criteria after the removal of duplicates. The inclusion criteria were as follows: studies focusing on physical activity interventions in prison settings, with participants being current or former prisoners. The studies could include various forms of physical activity, and participants could be of any age or gender, with or without chronic illnesses.

Systematic reviews and meta-analyses that concentrated on a single type of physical activity intervention or a specific aspect of health were included to provide a comprehensive overview of the effects of physical activity interventions on the well-being of incarcerated individuals. These reviews were used to summarize the current state of knowledge on the topic. Data were extracted on study design, population, intervention type, outcomes and findings. Data extraction was performed by two authors independently.

Results

In total, 1,736 potential articles were identified (1,400 from Google Scholar, 85 from PubMed and 251 from Web of Science). After a thorough review of the titles, abstracts and full texts, 54 articles were initially selected for discussion based on their relevance to the topic. However, to maintain a clear focus on studies that specifically examined the impact of physical activity interventions on prisoner well-being, we further refined our selection criteria. Of the 54 studies, only 12 met the criteria for inclusion in the final review. The excluded studies either did not involve a specific intervention or failed to analyze the well-being outcomes related to the physical activity interventions. These included five studies, with a cross-sectional design, evaluating the physical activity levels and associated well-being or the acceptance of some interventions already implemented ([Baccon *et al.*, 2024](#); [Kosendiak *et al.*, 2022](#); [Ortega Vila *et al.*, 2020](#); [Penado Abilleira *et al.*, 2023](#); [Tesler *et al.*, 2023](#)). Seven experimental or quasi-experimental studies were selected, that evaluated the impact of structured exercise programs, focusing on either strength training, endurance training or sports activities ([Battaglia *et al.*, 2015](#); [Herold *et al.*, 2023](#); [MacLean *et al.*, 2022](#); [Psychou *et al.*, 2019](#)); and assessed the effects of yoga or mindfulness programs ([Gallego *et al.*, 2023](#); [Harner *et al.*, 2010](#); [Kerekes *et al.*, 2019](#)). [Table 1](#) shows the main characteristics of the selected studies.

Several studies have been conducted over the years to assess the relationship between physical activity and mental and physical well-being in prisons. In other cases, rehabilitation programs that include physical activity or, better yet, sports programs have been proposed. Even though interest in this field has grown in the last 10 years, especially with the evident prison overcrowding and the need to implement prevention and rehabilitation programs to safeguard the health of inmates, as well as to prepare them for potential reintegration into the community without posing a threat on well-being dimensions, as well as in terms of infectious diseases and health.

It emerged that the majority of studies were conducted in Europe, mainly Spain, in addition, Germany, Italy, Poland, Sweden and Greece, one intervention study was performed in the USA in 2010 and two studies evaluating the physical activity levels were conducted in Israel and Brazil. We reviewed a total of 12 studies published from 2015 to 2024, only one study

Table 1 Summary of studies on physical activity and well-being in prisoners

<i>First author</i>	<i>Year</i>	<i>Country</i>	<i>Study design</i>	<i>Sample size (age, gender)</i>	<i>Intervention/focus</i>	<i>Main results</i>
<i>Observational studies</i>						
Ortega Vila	2020	Spain	Cross-sectional	468 (age: 18–50, 94% male)	To analyze the impact of sports-educational program (football) focusing on its influence on their lives during incarceration	Positive influence on prison experience and potential engagement in sports after release
Kosendiak	2022	Poland	Cross-sectional	211 (age: 18–65, 100% male)	Dietary habits, diet quality, nutrition knowledge and physical activity in prisoners	No significant correlation between physical activity and dietary habits or nutrition knowledge. Physical activity correlated with age and frequency of energy drink consumption
Penado Abilleira	2023	Spain	Cross-sectional	509 (age: 35, 70% male)	Impact of sports practice on health	Higher physical and mental health in active inmates; lower anxiety-depressive symptoms
Tesler	2023	Israel	Cross-sectional	522 (age: 18–60, 85% male)	Health promotion activities and physical activity levels	Most did not meet physical activity recommendations; participation linked to better health
Baccon	2024	Brazil	Cross-sectional	220 (age: 30–50, 80% male)	Physical activity levels and associated well-being	Identified age and sitting time as predictors of low physical activity
<i>Experimental or Quasi-Experimental studies</i>						
Battaglia	2015	Italy	Randomized controlled trial	64 (age: 28, 100% male)	Structured exercise programs (strength and endurance) (9 months)	Significant reduction in depression and anxiety; improved psychological well-being
Psychou	2019	Greece	Randomized controlled trial	60 (age: 30, 100% male)	Exercise program (6 months)	Improved quality of life and self-esteem in participants
MacLean	2022	UK	Pilot optimization study	120 (age: 20–45, 95% male)	Fit for LIFE™ lifestyle intervention (10 weeks)	Increased physical activity, reduced sedentary time, improved health behaviors
Herold	2023	Germany	Pretest posttest study	150 (age: 25–40, 90% male)	Endurance, strength training, martial arts, soccer (varied duration)	Improved interpersonal trust and subjective well-being
<i>Experimental yoga studies</i>						
Harner	2010	USA	Case crossover feasibility study	50 (age: 35, 100% female)	Iyengar yoga program (12 weeks)	Decrease in depression and anxiety symptoms among incarcerated women
Kerekes	2019	Sweden	Randomized controlled trial	111 (age: 32, 100% male)	Yoga intervention (10 weeks)	Improvements in personality profile and self-directedness
Gallego	2023	Spain	Controlled trial	22 (age: 30, 60% male)	Mindfulness-based interventions (8 weeks)	Significant reduction in stress and depression levels

Source: Table by authors

was published before in 2010; the sample sizes varying widely from 20 to 522 subjects across the studies. Most of the studies included subjects from all adult age groups, sometimes comparing effects between young adults, adults and older adults. Notably, the vast majority of intervention studies had samples consisting mainly of male subjects. When women were included, they represented only about 6% of the sample. Only one study that implemented a yoga intervention was conducted on a sample of incarcerated women.

Among the studies proposing an intervention, the exercise program lasted from six weeks to nine months.

Observational studies: analysis of physical activity levels in prison and their correlation with well-being

In 2023, Abilleira *et al.* conducted a study with the objective of evaluating the impact of sports practice on physical and mental health, as well as anxiety-depressive symptomatology, among a group of inmates in Galicia, Spain. The sample consisted of 509 male and female individuals incarcerated. This study does not specify the type of physical activity performed, and it does not appear to be a physical activity program offered to all inmates. Instead, it seems to be a self-initiated activity carried out independently. Nevertheless, the findings of the study revealed that inmates who engaged in physical activity during their time in prison exhibited higher levels of both physical and mental health, along with lower levels of anxiety-depressive symptoms compared to those who did not participate in sports. Interestingly, individuals who did not practice sports experienced a decline in their perceived health levels compared to their preprison stage. Furthermore, the study highlighted a negative association between perceived health levels and anxiety-depressive symptomatology (Penado Abilleira *et al.*, 2023).

Similarly, in the same year, Tesler and colleagues sought to examine the prevalence of participation in health promotion activities among Israeli inmates and its association with their physical activity levels and subjective health status (Tesler *et al.*, 2023).

The study included 522 inmates, the findings revealed that the majority of participants (82.37%) did not meet the recommended physical activity levels. Interestingly, half of the inmates reported a decrease in their physical activity since incarceration, while 29.50% reported an increase. Notably, younger male inmates exhibited significantly higher levels of physical activity and better subjective health status compared to their older counterparts. Participation in health-promoting activities correlated positively with higher levels of physical activity and subjective health status. Despite the positive impacts of health promotion programs, the study found that 50% of inmates reported decreased physical activity since incarceration and 43% did not participate in any health promotion program. These findings indicate a need for increased efforts and resources to enhance inmate participation in health promotion activities (Tesler *et al.*, 2023).

Ortega Vila's study aimed to assess the impact of a sports-educational program implemented in prisons through the Real Madrid Foundation's Social-Sports Program. The study involved surveying 468 inmates across 21 prisons in Spain. The inmates reported that their participation in the program positively influenced their prison experience and believed it could significantly contribute to their engagement in sports after release. The participants expressed that they gained substantial knowledge about football-related content and values emphasized in the program, resulting in a highly positive impact on their personal development (Ortega Vila *et al.*, 2020).

The implications of these findings suggest that health promotion activities play a vital role in addressing the health challenges faced by inmates. Inmates participating in health promotion programs were more likely to meet recommended physical activity levels and report better health. Furthermore, the study highlighted that demographic factors such as age and sex significantly predicted health status and physical activity levels. Female

inmates were less likely to meet physical activity recommendations and reported poorer health compared to male inmates. This disparity points to the need for health promotion activities tailored to the specific needs of female inmates, who often face more significant health challenges and require more health care services than their male counterparts.

Baccon *et al.* recently conducted a study to evaluate the levels of physical activity and health conditions among Brazilian prisoners and to identify predictors of low physical activity. The sample included 220 inmates. The results showed that more than half of participants did not meet the WHO's recommended levels of physical activity, with older age and prolonged sitting time being significant predictors of low physical activity (Baccon *et al.*, 2024).

The results of this study align with the previous study by Kosendiak from Poland, indicating a correlation between prisoners' age and their physical activity levels (Kosendiak *et al.*, 2022).

In summary, these studies collectively highlight the critical role of structured health promotion activities in prisons to enhance physical activity levels and overall well-being of inmates. They also point to the necessity of age- and gender-specific interventions to address the unique health challenges faced by different inmate demographics.

Experimental or quasi-experimental studies: the effects of structured exercise programs on well-being in prisons

In 2015, a study conducted by Battaglia in Italy examined the effects of physical exercise on the psychological well-being of prisoners. Sixty-four participants were randomly assigned to three groups:

1. cardiovascular plus resistance training;
2. high-intensity strength training; and
3. no exercise.

Before and after the nine-month experimental period, all participants completed a questionnaire assessing psychological symptoms. The results revealed that each form of exercise significantly reduced depression scale scores compared to the control group and improved scores on anxiety, phobic anxiety and hostility scales (Battaglia *et al.*, 2015).

In alignment with the objective of Battaglia's study, subsequently, the purpose of the study by Psychou was to examine the effect of an exercise program on the quality of life and self-esteem of sixty male inmates in Greek prisons. The results demonstrated a significant positive impact of the exercise program on both the mental and physical components of quality of life and self-esteem in the experimental group. Specifically, participants in the exercise group reported fewer problems with daily activities and felt more energetic and vigorous compared to those in the control group. Postintervention measurements using the Rosenberg Self-Esteem Scale showed that inmates in the exercise group had higher self-esteem levels compared to the control group (Psychou *et al.*, 2019).

Alice MacLean conducted a study to outline the collaborative development of a healthy lifestyle intervention named "Fit for LIFE" for incarcerated men and the feasibility testing of its implementation through prison physical education departments. The program encompasses several components designed to tackle common barriers to a healthy lifestyle within prison. "Fit for LIFE" is a 10-week group-based healthy lifestyle intervention intended for delivery within prison gymnasiums. The weekly 90-min sessions combine informative and interactive classroom activities followed by practical physical activity training sessions, often involving group activities. The program aims to assist incarcerated men in increasing physical activity, reducing sedentary time, adopting healthier eating habits and gaining confidence in using prison gym facilities. Overall, this campaign was

successful in drawing male inmates to the prison gyms, giving them the opportunity for the men to engage in more positive expressions of masculinity, fostering positive connections, changing their health-related behaviors and using gym facilities more frequently (MacLean *et al.*, 2022).

Elisa Herold conducted a study in Germany in 2021 to examine the effects of four different sport programs on various social and subjective health outcomes among prisoners (Herold *et al.*, 2023). The four sport programs provided were endurance training, strength training, dance-like martial arts and soccer. The findings of the study indicated that the endurance program had a significant positive effect on interpersonal trust, while subjective well-being increased significantly after the strength and soccer programs. In conclusion, Elisa Herold's study sheds light on the effects of different sport programs on prisoners' social and subjective health outcomes. The results suggest that sport can positively impact prisoners' well-being and interpersonal trust, potentially contributing to their rehabilitation process. This research highlights the importance of incorporating sport and physical activity programs in prison settings as a means of enhancing prisoners' overall health and well-being.

These five studies collectively highlight the significant benefits of exercise and sport programs on the psychological and physical well-being of prisoners, while also revealing some differences in their findings. All studies consistently demonstrate that exercise programs positively impact prisoners' psychological well-being. Beyond individual psychological benefits, several studies point to broader social outcomes. Herold *et al.* (2023) noted increased interpersonal trust from endurance training and Ortega Vila *et al.* (2020) reported that inmates believed sports programs could aid their postrelease engagement in sports and personal development.

According to social health outcomes, exercising while incarcerated can improve self-worth, self-control and confidence as well as foster the growth of interpersonal skills including teamwork and communication. Sport during incarceration encourages communication, lessens tensions and fosters increased relationships among inmates. Additionally, playing sports while incarcerated has been linked to better social interactions and less violent behavior. A sport program created with the requirements of inmates can enhance the acceptance, understanding and assimilation of laws and regulations, additionally, taking part in a sports program can make it easier to get employment after release from prison.

Despite differences in the types of activities and specific outcomes, the consistent finding is that participation in physical activities leads to improved mental health and social outcomes. These results underline the importance of incorporating diverse and culturally relevant exercise programs in prisons to address both psychological and physical health needs effectively. The studies also highlight the necessity for tailored interventions that consider the unique contexts and demographics of prison populations, ensuring that programs are inclusive and effective across different inmate groups.

Experimental yoga studies: the effects of yoga and mindfulness interventions on well-being in prisons

The study of Harner *et al.* marked the initial effort to implement a gender-specific Iyengar yoga program aimed at boosting confidence and alleviating stress among incarcerated women. The intervention consisted of two weekly sessions over a 12-week period. The results indicated a significant linear decrease in depression symptoms, anxiety symptoms also showed a marginally significant decrease, however, perceived stress demonstrated a nonlinear change, initially decreasing from baseline to week 4 but then increasing again by week 12. The study concluded that the Iyengar yoga program effectively reduced symptoms of depression and anxiety among incarcerated women (Harner *et al.*, 2010). In accordance, the 2015 systematic review and meta-analysis by Auty *et al.* found that yoga

and meditation programs have positive benefits for the participants, with a larger effect size observed for psychological well-being suggesting these programs might have a more immediate impact on brain functioning, while the effects on behavior might require a longer follow-up period to become significant (Auty *et al.*, 2017).

Later in 2019, Kerekes conducted a study in Sweden that aimed to examine the potential effects of a 10-week-long yoga intervention on the personality profile of male prison inmates. Prior research had linked a specific personality profile characterized by low character maturity and high novelty seeking to aggressive antisocial behavior in inmates. The study also built upon previous findings that showed positive impacts of yoga practice on inmates' well-being and risk factors related to criminal recidivism. The study involved 111 male prison inmates who were randomly assigned to either a yoga group or a control group. The yoga group participated in one weekly yoga class, while the control group engaged in free-choice weekly physical activity. The results showed that after the intervention period, the male inmates who participated in yoga exhibited significant improvements in their personality profile. The yoga group experienced a significant interaction effect favoring increased self-directedness, indicating notable improvements in their ability to take responsibility, feel purposeful and have greater self-acceptance. These enhancements in character maturity are associated with decreased aggressive antisocial behavior (Kerekes *et al.*, 2019).

A group of Spanish researchers undertook a comprehensive study to explore the potential benefits of mindfulness-based interventions and adapted sport programs for individuals with severe mental disorders within a prison setting. The researchers aimed to investigate the impact of these interventions on symptoms of anxiety, depression and impulsive behaviors, which are prevalent among this population. Twenty-two inmates were involved, and the results revealed a significant reduction in stress and depression levels among participants in the mindfulness intervention group when compared to the control group (Gallego *et al.*, 2023). Even if a meta-analysis points out that the results of mindfulness are not as high if they are compared to an active group (Nidich *et al.*, 2016).

All the studies demonstrated notable improvements in mental health outcomes among participants. The studies suggest that while immediate benefits on mental health are evident, long-term behavioral changes may require extended follow-up. Auty *et al.* emphasized that the positive effects on behavior from yoga and meditation might need a longer duration to become significant, echoing the sustained improvements in character maturity and self-directedness noted by Kerekes *et al.* However, the variation in specific outcomes and the need for tailored approaches to address different aspects of inmate health underscore the complexity of implementing these interventions effectively.

Discussion

The studies reviewed highlight the critical role of physical activity in improving the mental and physical health of incarcerated individuals. While structured sports programs are beneficial, broader physical activity interventions that include yoga, mindfulness and general exercise routines can cater to a wider range of inmate needs. These interventions can significantly benefit populations with varying physical abilities and mental health conditions. For instance, female inmates, who often face greater health challenges and have lower participation rates in physical activity, may benefit more from yoga and mindfulness programs tailored to address stress and anxiety. Similarly, older inmates or those with limited mobility might find gentle exercise routines more accessible and beneficial for their mental well-being. Therefore, the inclusion of diverse physical activity programs can address the specific health needs of different demographic groups within the prison population.

Subjective well-being rises with participation in sport in jail, both in terms of objective and subjective health outcomes (Battaglia *et al.*, 2015). Similar to these findings, previous studies and studies that have predominantly focused on physical outcomes reported a significant beneficial effect following participation in a fitness program and lowers inmates' body mass index (Elwood Martin *et al.*, 2013) and improves their overall health state (Mannocci *et al.*, 2018). On the other hand, if inmates do not engage in any physical activity while they are incarcerated, their health may dramatically decline. Due to the correlation between incarceration and unhealthy behaviors including physical inactivity, substance misuse, smoking and violence, it is increasingly important to promote healthy behaviors like sports (Fazel and Baillargeon, 2011).

Only Elisa Herold's study gave inmates the option to participate in a variety of sport programs. The ramifications of providing a variety of sport programs within jail facilities, however, have not yet been properly addressed in the current research environment. Prison administrators can create more effective and specialized interventions to help the inmates by researching numerous sport possibilities and their corresponding consequences.

Another drawback is that prior research has a propensity to focus mainly on social health or objective/subjective health outcomes, frequently only looking at one particular result at a time. This method falls short of offering a thorough grasp of how various sport programs may affect both social and physical health issues. Prison administrators would significantly benefit from a more comprehensive investigation that identifies which athletic programs are most likely to produce particular social or subjective health outcomes to get insightful information.

Sport has emerged as a potential catalyst for generating diverse social and subjective health outcomes within society, making it a significant activity during the rehabilitation process of prisoners (Andrews and Andrews, 2003). Engaging in sporting activities allows inmates to break free from the uninteresting and tedious routines of daily imprisonment (Lleixà and Rios, 2015). An important note, however, is that people who are detained are less likely than those who are not incarcerated to meet prescribed physical activity guidelines, despite having access to outdoor exercise spaces like the exercise yard and prison gym (Herbert *et al.*, 2012).

As well-known physical activity serves as a potent tool in mitigating the burden of chronic illnesses. By actively engaging in exercise, individuals suffering from conditions such as heart disease, diabetes and hypertension can experience a reduction in symptoms, improved disease management and a slower disease progression (Papa *et al.*, 2021). Physical activity can alleviate pain, enhance mobility and boost cardiovascular health, effectively addressing the challenges associated with chronic illnesses (Nystoriak and Bhatnagar, 2018).

However, we need to make a distinction between sports and general physical activity interventions in prison settings because it is crucial for developing effective rehabilitation programs. Sports programs, such as soccer or basketball, often emphasize teamwork, competition and skill development. They can be instrumental in fostering social connections, improving self-esteem and reducing aggressive behaviors among inmates. However, these programs may not be accessible or appealing to all prisoners, particularly those with lower physical fitness or interest in competitive sports. On the other hand, general physical activity interventions, such as walking, yoga or fitness classes, offer more inclusive and flexible options that can be adapted to individual preferences and capabilities. These activities are often less competitive and more focused on personal health and well-being, making them suitable for a broader range of participants. By offering a combination of sports and general physical activities, prisons can ensure that all inmates have the opportunity to engage in physical exercise that meets their unique needs and interests.

Furthermore, by supporting sports within correctional facilities, inmates may experience not only physical benefits but also improved social interactions, enhanced mental well-being and a sense of purpose and accomplishment. The positive impacts of sports on prisoners' health and social integration have garnered attention as promising avenues for promoting rehabilitation, reducing recidivism and ultimately fostering a more rehabilitative and inclusive prison environment (Woods *et al.*, 2017).

This trend has prominently underscored the utilization of sports engagement as an economically viable yet potent tool within prison settings (Meek and Lewis, 2014). Within this realm, a notable emphasis has been placed on harnessing sports participation as a vehicle to foster positive leadership skills, particularly among individuals, most notably the youth, whose personal development encompassing character and decision-making capabilities is still in progress. Sport programs, exemplified by activities like football, rugby and boxing, have emerged as comprehensive interventions combining physical activity with vocational training, the assimilation of life skills and engagement in volunteering endeavors (Parker *et al.*, 2014).

Despite variations in geographical locations and the diverse tiers of rehabilitation centers in which these studies have been conducted, the intrinsic potential of sport interventions to yield psychosocial, physical and mental health benefits for this specific population remains an important field of study.

Another important issue concerns the location of physical activity – inside or outside prison cells – this can significantly impact the effectiveness of interventions. Activities conducted outside, such as in prison yards or gymnasiums, provide inmates with a change of environment, exposure to fresh air and sunlight and the opportunity for social interaction. These factors contribute to enhanced mental well-being and provide a break from the monotonous routine of prison life. However, access to outdoor spaces can be limited by security concerns, weather conditions and facility resources. Conversely, activities that can be performed inside cells, such as bodyweight exercises, yoga or meditation, offer flexibility and require minimal equipment, allowing inmates to exercise regularly regardless of external constraints. While outdoor activities are valuable for their environmental and social benefits, promoting indoor exercises ensures continuity and consistency in physical activity, particularly in restrictive settings. Balancing both approaches enables prisons to provide comprehensive physical activity programs that accommodate various constraints and promote the holistic well-being of inmates.

Conclusion

The studies reviewed provide compelling evidence for the significant role that physical activity plays in enhancing both the mental and physical well-being of incarcerated individuals. Over the past decade, there has been an increasing focus on integrating rehabilitation programs, including both sports and broader physical activity interventions, within prison settings. This growing interest is driven by the need to address the health challenges posed by prison overcrowding and to prepare inmates for successful reintegration into society.

The majority of the studies were conducted in European countries, with some contributions from the USA, Israel and Brazil. They demonstrate a wide range of sample sizes and intervention durations, reflecting diverse approaches to promoting inmate well-being. Notably, the studies highlight the importance of tailoring interventions to different demographic groups, as many interventions predominantly involved male participants, with female inmates underrepresented. The findings emphasize the need for gender-specific programs, particularly those that can effectively address the unique health challenges faced by female inmates.

Overall, the research underscores the benefits of structured exercise programs, sports and mindfulness practices in reducing anxiety, depression and hostility among prisoners. These interventions foster social connections and enhance self-esteem, trust and interpersonal skills, contributing to a healthier prison environment. While sports programs are effective in promoting teamwork and reducing aggressive behaviors, general physical activity interventions provide more inclusive options that accommodate individual preferences and capabilities. The location of physical activities, whether inside cells or in outdoor spaces, also plays a crucial role in the success of these interventions, with both indoor and outdoor activities offering distinct benefits.

To maximize the positive impacts of physical activity in prisons, it is essential to design and implement diverse, culturally relevant programs that address the specific needs of various inmate populations. By doing so, prisons can foster an environment that supports rehabilitation, reduces recidivism and enhances the overall well-being of inmates. Future research should continue to explore the long-term effects of these interventions and investigate how they can be adapted to different cultural and institutional contexts, ultimately contributing to more effective and humane correctional systems.

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