Beyond Mistakes: Opportunities and Challenges of XR for Staff in Prison and Probation Settings

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Abstract

Criminal justice systems worldwide face persistent challenges in reducing reoffending, with prison and probation staff operating in emotionally demanding, high-pressure environments that shape rehabilitation outcomes. While extended reality (XR) has begun to be explored as an intervention for people with convictions, little attention has been given to how XR might support the staff responsible for delivering rehabilitative practices. This position paper argues that XR offers under-researched opportunities to enhance staff wellbeing, professional judgement, and relational practice within prison and probation contexts. Drawing on human–computer interaction (HCI) research and social psychological theory, we outline potential benefits and applications of XR in prison and probation settings. We further examine institutional constraints, including security risks, intergroup dynamics, and perceived inequities in technology access, arguing that co-creation is essential to responsible implementation. Rather than positioning XR as a technological solution, we frame it as a relational tool embedded within existing power structures and organisational cultures. Advancing this agenda requires interdisciplinary collaboration and rigorous empirical evaluation to assess both benefits and unintended consequences in correctional environments.

Keywords

Recidivism, XR, Prisons, Skills development

1. Introduction

The aim of criminal justice systems across the world is to reduce reoffending by people who have been convicted of a crime, who are referred to in this paper as people with convictions (PWC). A systematic review of data from 33 countries found 2-year reconviction rates between 18% and 55% [1], demonstrating the extent of this issue. There are a variety of strategies that have been applied within criminal justice systems to reduce reoffending, which include educational and vocational training, substance use treatment, cognitive behavioural therapy, mental health treatment, and restorative justice schemes [2]. These strategies are applied both within prisons and in post-release settings, with the latter provided by probation services. This can involve cross-agency working with stakeholders from organisations such as local housing authorities and healthcare providers, as well as third-sector organisations such as charities who seek to support PWC in establishing a positive and socially responsible life post-release [2]. This creates a complex system of overlapping and interconnected rehabilitation support that takes place both inside prisons and in a range of external settings. For the purposes of this paper 'probation workers' is used as an umbrella term to refer to any individual or organisation who provides PWC with rehabilitation support on release from prison. As such, PWC go through a journey in the rehabilitation process that begins in a prison setting, which can vary markedly in security restrictions and physical facilities, and continues into a multitude of different post-release and probation services, which also vary in scope and characteristics. If an individual does then reoffend and is reconvicted, they may experience a different pathway through this system, depending on the nature of their reoffending

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and the availability of local services. Despite the efforts of the agencies involved reoffending by PWC remains a persistent problem, with reoffending reduction strategies restricted by resource limitations, a lack of tailored approaches, and inconsistent application of behaviour change models [2].

A common theme throughout reoffending reduction strategies is supporting PWC to develop a new sense of self through learning new skills, including employment and vocational skills. This is consistent with the 'redemption script' that has been reported in work with PWC, in which the individual states that their former 'criminal self' is not reflective of who they believe they truly are or want to be [3]. These strategies are either delivered or facilitated by prison staff and probation workers within the criminal justice system. Prisons are a unique setting which includes situational and security restrictions that differ from other instances where training and education are delivered. Similar restrictions can be present in probation settings that PWC may encounter post-release, depending on the nature of that probation service.

As such, prison officers are a fundamental part of the system that a PWC encounters when they are first convicted and begin a prison sentence. More broadly, the introduction of new technologies into professional roles risks eroding the sense of identity and agency that staff derive from their work [4]. It has been observed that the prison officer role is a complex and emotionally demanding one that involves moral decision making and requires judgement, legitimacy, and relational skills [5]. This highlights that the interactions between prison staff and PWC are an important detriment of reoffending reduction, where staff power is often relational rather than coercive, and that training is important in influencing how power is exercised [5]. In addition, the prison setting has also been associated with high levels of stressors and strains amongst prison officers, which are greater than those observed within other emergency and security services [6]. Similarly, issues with burnout have been documented in people who work in probation services [7].

Emergent research has demonstrated how XR technologies can be used with PWC in prison settings, such as the Virtual Reality Aggression Prevention Training (VRAPT), which included mapping of risk situations, skills training and management of emotions and social problem-solving skills [8]. For the purposes of this paper, extended reality (XR) is used as an umbrella term to refer to virtual reality (VR), augmented reality (AR) and mixed reality (MR), in keeping with [9]. However, there is a lack of research on how these technologies can be used by and for prison staff and those who work in probation services and relevant third-sector organisations. As such, this position paper argues that XR technologies have the potential to provide unique and valuable opportunities to empower prison staff and probation workers to better support PWC in reducing their risk of reoffending, as informed by HCI research and social psychological theories. In doing so, it also considers the constraints and risks that must be taken into consideration.

2. The Potential for XR Use by Prison Staff and Probation Workers

It has been noted that prison officers operate in a state of continuous alertness, in which they feel they must always be on guard [10], which can result in job stress and burnout [11]. Research in other high-pressure contexts has demonstrated how XR can be used to reduce stress reactivity and to promote emotional regulation [12], a technique that can be further enhanced through the use of biofeedback [13]. This may be beneficial in promoting resilience amongst staff in prison and probation systems, by enabling the early identification of threats and allowing preventative and harm mitigation techniques to be implemented. Within the prison context this could for example involve aiding staff in identifying when they are beginning to become stressed during a tense interaction with a PWC, so that they can take action such as removing themselves from the situation before their judgement is impaired. This connects to the XR4CE workshop's principle of resilience by design, which calls for systems that support users in sustaining effective functioning under stress, rather than adding new cognitive burdens. Due to the live nature of biofeedback and the ability for XR system to be adaptive, this could also promote calibrated trust, in which the system updates in real-time — enabling staff to develop well-founded confidence in the system's capabilities rather than over- or under-relying on

its outputs. The inclusion of eye tracking within XR technologies may also provide insights into how training is cognitively processed during high stress situations, as has been investigated in relation to firefighters [14]. This could be applied to continuing professional development (CPD) in prison and probation settings, to better understand what key visual information prisons staff focus on in their roles, and how this influences their decision making. Eye tracking can also be used to measure other important factors such as cognitive overload and fatigue, which, in conjunction with XR, can be used to further explore how prison staff engage with training and CPD.

As commented, it has been argued that the relationship between PWC and prison staff is an important factor in shaping the success of training and education strategies that aim to reduce reoffending [5]. This is something which could be supported by perspective taking, in which someone imagines the viewpoint and experiences of another person. This approach is already used within prisons as part of various strategies for PWC [15] and which has been explored in relation to prison staff [16]. It has also been found that XR can be used to promote empathy across a range of settings [17], although with some distinctions made between emotional empathy (feeling someone else's emotions as if they were your own) and cognitive empathy (understanding someone's perspective intellectually). Within a prison context, this could for example involve prison officers using XR to experience the challenges faced by prisoners, such as restricted movement, lack of privacy, and a loss of agency over personal decision making. The knowledge that prison staff have had this experience could be expected to result in more positive relations with PWC, in keeping with social psychological research which demonstrates that shared experience between different groups can create a greater sense of a social bond [18]. XR could also be implemented in probationary settings outside of prisons, although it acknowledged that the greater variety of such settings would first require a better understanding of the affordances and restrictions of those specific settings.

3. Practical Applications

It is important to distinguish between two complementary domains of XR use: training contexts, in which XR supports skill development outside of active duty, and operational contexts, in which XR delivers real-time assistance to staff during their working day. Both domains are relevant to prison and probation settings, and each relates differently to the three XR4CE design principles. This potential has been demonstrated with professionals who provide support during disasters and emergency situations [19]. In the case of a prison riot, this could include AR-delivered information on the location of other staff members, the status of locked and unlocked areas, and specific alerts to staff. A concrete design concept here would be an AR glasses worn during operational duties that overlays colour-coded zone alerts and staff GPS positions onto the officer's view of the physical environment, triggered by sensor data already present in the prison infrastructure (e.g. door-lock status, radio calls). This would demonstrate situated explainability, with embodied cues delivered through electronic means but presented in real-time within the physical environment - making system outputs interpretable within the specific context in which they are used, rather than abstracted to a separate screen or report. This would improve prison staff's situational awareness. A similar approach could be applied within probation settings, where staff or charity volunteers support PWC who have been released and who are attempting to navigate challenges such as housing applications; an AR overlay could provide workers with relevant procedural prompts and agency contact details contextually within their environment, reducing cognitive load at moments of high demand.

4. Co-creation and Collaboration

XR can also be used for CPD through case-based scenarios [20], an approach which may be useful for more junior prison staff. This could include scenarios based on the experience of more senior officers, using co-creation techniques. This refers to a collaborative approach in which designers, researchers and stakeholders jointly participate in the generation, refinement and implementation of ideas, with

participants being active contributors rather than passive recipients [21]. Within the prison context, this could for example involve presenting prison staff with XR facilitated scenarios which have been devised by experienced staff members, asking participants to choose how they would respond in certain scenarios. Such scenarios could include recreations of real-world incidents that have occurred in the prison based on data collected by XR devices during those incidents. In practice, a co-creation process for such a tool might involve structured workshops with serving and retired officers to identify the most instructive real-world scenarios, iterative prototyping of immersive VR simulations capturing those scenarios, and participatory evaluation in which officers engage with the scenarios and provide feedback on realism, emotional salience, and practical transferability. Crucially, this process should include diverse representation across seniority levels, roles, and demographic backgrounds to mitigate the risk that scenarios reflect only majority experiences. A further development of this idea could involve the input from PWC who have since left prison and established positive post-release lives. This could provide insights without the potential operational risk that could arise from current prisoners being made aware of the details of prison systems. Similarly, this approach could be used for CPD when there is a requirement for staff to develop new skills in relation to organisational policies and practices.

5. Considerations and Challenges

An immediate concern regarding introducing XR technologies to a prison setting is the security risks this may pose, an issue which has been discussed in relation to other new technologies [22, 23]. One way to structure these concerns is via the TIPSS framework, addressing Trust, Identity, Privacy, Security, and Safety, which has been applied to the governance of emerging technologies in related contexts [24]. Co-creation approaches can be useful to leverage insights from prison staff on how to mitigate these risks. Beyond security concerns, prior work has identified dark patterns specific to XR environments that could, if unaddressed, undermine user autonomy and trust in deployed systems [25]. As part of this process, work can also be undertaken to understand the barriers to adoption that prison staff may feel would prevent successful implementation of XR technologies. Nevertheless, there are additional concerns that need to be addressed. These include biometric data governance if, for instance, eye tracking techniques were used as part of the XR technology. It is also possible that the XR technologies could be used to monitor prison staff's performance in a way that goes beyond what those staff members are aware of and have agreed to. Research on AR-driven manipulation in consumer contexts demonstrates how the same attentional and perceptual affordances that make XR valuable for training can be exploited to influence behaviour in ways users may not detect [26]. Bystander privacy, including that of prisoners who may be captured by staff-worn XR devices, raises distinct consent challenges that have begun to be examined in everyday AR contexts [27]. In more practical terms, there would be logistical issues such as charging and maintaining XR devices, as well as keeping these sanitised if being used by multiple people. There are also significant technical infrastructure constraints that are specific to this environment. Prisons typically restrict or prohibit internet connectivity for security reasons, which means that cloud-dependent XR applications would be unsuitable without local server infrastructure. This would require investment in on-premises systems and raise further questions about maintenance, data storage, and jurisdiction over collected data. The physical conditions of prison environments — including concrete construction affecting wireless signal, limited charging facilities, and the requirement for robust hardware that can withstand institutional conditions — add further constraints that must inform any design process. In probation settings the picture varies considerably, from purpose-built offices to community venues with minimal infrastructure, meaning that any XR deployment would need to be flexible and low-dependency. These are not insurmountable problems, but they underscore the importance of grounding design decisions in the specific operational realities of each setting rather than adopting off-the-shelf solutions developed for other contexts.

A further consideration is how PWC may perceive prison and probation staff having access to XR equipment, which could itself become a source of tension. The provision of XR could cause inter-group conflict through creating a sense of inequality, which can occur when one group perceives

another group to unfairly have access to something that is high value [28]. In keeping with equity theory, people evaluate fairness based on the balance between their effort and rewards, compared to others [29]. As such, staff may in turn perceive themselves to be carrying the risk over the use of XR by PWC, and it be unfair for PWC to be rewarded through access to these technologies. This reflects foundational social psychological research that demonstrates that individuals resent when one group is given something they are denied [30]. This could be particularly the case with the use of XR technologies because, in contrast to other types of training resources, they are often viewed as being more fun [8]. As such, PWC who know that prison staff are using XR technologies for training, whilst not having the opportunity to use such technologies themselves, may feel resentment. This would undermine the sense of shared experience that can be achieved through strategies such as using XR to give prison staff insights into life as a prisoner. It is interesting to note, however, that access to traditional media technologies such as television has been reported as being an important factor maintaining peace and stability in prison environments [31]. This could suggest that prison staff would be open to PWC accessing XR technologies if this reduces the amount of conflict they must manage between prisoners. There are also questions about whether participation in XR-based training or support can be genuinely voluntary within an institution characterised by power differentials, and whether the affective intensity of immersive technologies, such as perspective-taking experiences, requires additional duty-of-care considerations for both staff and PWC. Evidence from other vulnerable populations suggests that the immersive nature of XR creates safeguarding obligations that go beyond those required for conventional media [32]. These ethical questions should be addressed through clear institutional policies, transparent communication with all stakeholders including PWC, and independent ethics oversight of any implementation or research programme.

6. Conclusions

When informed by HCI principles, social psychological theory, and co-creative design processes, XR offers a distinctive opportunity to support prison and probation staff in emotionally demanding, morally complex, and high-stakes environments. By enhancing emotional regulation, situational awareness, and perspective taking, while remaining attentive to issues of power, equity, and institutional legitimacy, XR may contribute not only to staff wellbeing but also indirectly to reoffending reduction outcomes. The applications outlined here span both training and operational domains, and can be understood through the three XR4CE design principles: resilience by design, through XR-supported stress and emotional regulation that helps staff sustain effective functioning; calibrated trust, through adaptive biofeedback systems that staff can appropriately rely on without over-dependence; and situated explainability, through AR overlays that deliver contextually relevant information within the physical environment in real time. These principles provide a useful framework for moving from a broad exploration of possibilities to a more focused design trajectory, and we call for empirical work that tests these applications against this framework in the correctional context. We argue that advancing this agenda requires interdisciplinary collaboration between XR researchers, criminal justice practitioners, and social scientists, alongside rigorous empirical evaluation of both benefits and unintended consequences. In doing so, XR research can move beyond prisoner-focused interventions to consider the broader relational ecosystem that shapes desistance and rehabilitation.

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Declaration on Generative AI

The author(s) have not employed any Generative AI tools.

References

[1] D. Yukhnenko, L. Farouki, S. Fazel, Criminal recidivism rates globally: A 6-year systematic review update, Journal of criminal justice 88 (2023) 102115.

[2] European Crime Prevention Network (EUCPN), Toolbox on reducing recidivism, 2024.

[3] S. Maruna, Desistance and restorative justice: It's now or never, 2016.

[4] Y. Lu, C. Sengul, E. Apeh, I. Reid, J. McAlaney, K. Han, P. Saeghe, Ai and identity erosion (2026).

[5] B. Crewe, Soft power in prison: Implications for staff–prisoner relationships, liberty and legitimacy, European journal of criminology 8 (2011) 455–468.

[6] G. Kinman, A. James Clements, J. Hart, Work-related wellbeing in uk prison officers: a benchmarking approach, International Journal of Workplace Health Management 9 (2016) 290–307.

[7] C. Ilie, C. M. Ionașcu, A. M. Niță, Mapping occupational stress and burnout in the probation system: A quantitative approach, Societies 15 (2025) 242.

[8] S. Klein Tuente, S. Bogaerts, E. Bulten, M. Keulen-de Vos, M. Vos, H. Bokern, S. v. IJzendoorn, C. N. Geraets, W. Veling, Virtual reality aggression prevention therapy (vrapt) versus waiting list control for forensic psychiatric inpatients: a multicenter randomized controlled trial, Journal of clinical medicine 9 (2020) 2258.

[9] M. Slater, M. V. Sanchez-Vives, Enhancing our lives with immersive virtual reality, Frontiers in Robotics and AI 3 (2016) 74.

[10] A. Liebling, D. Price, G. Shefer, The prison officer, Willan, 2010.

[11] C. Finney, E. Stergiopoulos, J. Hensel, S. Bonato, C. S. Dewa, Organizational stressors associated with job stress and burnout in correctional officers: a systematic review, BMC public health 13 (2013) 82.

[12] S. Meshkat, M. Edalatkhah, C. Di Luciano, J. Martin, G. Kaur, G. H. Lee, H. Park, A. Torres, A. Mazalek, B. Kapralos, et al., Virtual reality and stress management: a systematic review, Cureus 16 (2024).

[13] O. D. Kothgassner, A. Goreis, I. Bauda, A. Ziegenaus, L. M. Glenk, A. Felnhofer, Virtual reality biofeedback interventions for treating anxiety: A systematic review, meta-analysis and future perspective, Wiener Klinische Wochenschrift 134 (2022) 49–59.

[14] R. K. Mehta, J. Kang, Y. Shi, J. Du, Effectiveness of training under stress in immersive vr: an investigation of firefighter performance, gaze entropy, and pupillometry, Frontiers in Virtual Reality 6 (2025) 1542507.

[15] A. G. Martinez, J. Stuewig, J. P. Tangney, Can perspective-taking reduce crime? examining a pathway through empathic-concern and guilt-proneness, Personality and Social Psychology Bulletin 40 (2014) 1659–1667.

[16] C. Vickers-Pinchbeck, Prison officers' perspectives on five minute interventions and rehabilitative culture in a local prison, Prison Service Journal 244 (2019) 44–51.

[17] A. J. Martingano, F. Hererra, S. Konrath, Virtual reality improves emotional but not cognitive empathy: A meta-analysis., Technology, Mind, and Behavior 2 (2021) 7.

[18] V. Chung, R. Mennella, E. Pacherie, J. Grezes, Social bonding through shared experiences: the role of emotional intensity, Royal Society Open Science 11 (2024) 240048.

[19] S. Symeonidis, S. Diplaris, N. Heise, T. Pistola, A. Tsanousa, G. Tzanetis, E. Batziou, C. Stentoumis, I. Kalisperakis, S. Freitag, et al., xr4drama: Enhancing situation awareness using immersive (xr) technologies, in: 2021 IEEE International Conference on Intelligent Reality (ICIR), IEEE, 2021, pp. 1–8.

[20] A. Berglund, Empowering xr proficiency: exploring professional case-based learning scenarios, in: INTED2024 Proceedings, IATED, 2024, pp. 6821–6828.

[21] E. B.-N. Sanders, P. J. Stappers, Co-creation and the new landscapes of design, Co-design 4 (2008) 5–18.

[22] Y. Jewkes, B. C. Reisdorf, A brave new world: The problems and opportunities presented by new media technologies in prisons, Criminology & Criminal Justice 16 (2016) 534–551.

[23] M. Abraham, P. Saeghe, M. Mcgill, M. Khamis, Implications of xr on privacy, security and behaviour:

Insights from experts, in: Nordic Human-Computer Interaction Conference, 2022, pp. 1–12.
[24] E. Apeh, P. Saeghe, S. K. Mostefaoui, Y. Lu, L. Shang, Ai alignment in the context of tipss (2026).
[25] V. Krauß, P. Saeghe, A. Boden, M. Khamis, M. McGill, J. Gugenheimer, M. Nebeling, What makes xr dark? examining emerging dark patterns in augmented and virtual reality through expert co-design, ACM Transactions on Computer-Human Interaction 31 (2024) 1–39.
[26] M. Ruocco, P. Saeghe, F. Kerber, J. Gugenheimer, M. McGill, M. Khamis, From redirected navigation to forced attention: Uncovering manipulative and deceptive designs in augmented reality through retail shopping, in: 2024 IEEE International Symposium on Mixed and Augmented Reality (ISMAR), IEEE, 2024, pp. 720–729.
[27] J. O'Hagan, P. Saeghe, J. Gugenheimer, D. Medeiros, K. Marky, M. Khamis, M. McGill, Privacy-enhancing technology and everyday augmented reality: Understanding bystanders' varying needs for awareness and consent, Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies 6 (2023) 1–35.
[28] H. Tajfel, J. Turner, W. G. Austin, S. Worchel, et al., An integrative theory of intergroup conflict, Intergroup relations: Essential readings (2001) 94–109.
[29] J. S. Adams, Inequity in social exchange, in: Advances in experimental social psychology, volume 2, Elsevier, 1965, pp. 267–299.
[30] F. Crosby, A model of egoistical relative deprivation., Psychological review 83 (1976) 85.
[31] E. Grant, Y. Jewkes, More important than guns or grog: The role of television for the health and wellbeing of australian aboriginal prisoners, Current Issues in Criminal Justice 25 (2013) 667–683.
[32] C. Fiani, P. Saeghe, M. McGill, M. Khamis, Exploring the perspectives of social vr-aware non-parent adults and parents on children's use of social virtual reality, Proceedings of the ACM on Human-Computer Interaction 8 (2024) 1–25.