



# XR technology and risk assessment: The future of probation training?

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## Abstract

Risk assessment and prediction play a key role in decision-making in probation practice. Yet the practical application of risk assessment judgements can be impacted by a range of factors, with implications for people under supervision as well as for potential victims and the community. Furthermore, there has been a shift within probation training to remote and online learning platforms to support workplace development. This article describes an exploratory study assessing the capacity of technology-enhanced training tools for enhancing and improving risk assessment in probation home visits. The findings indicate that, despite the limitations of the research, virtual reality and 360° videos may be valuable tools for addressing a number of the inherent challenges facing current probation training.

## Keywords

Immersive technology, probation, risk assessment, training, virtual reality

## Introduction

Risk assessment and prediction play a key role in decision-making across all aspects of professional practice, with fields such as medicine and finance at the forefront of research and theory in this area (Beck, 1992). Throughout the criminal justice process, decision-making is guided by the assessment of risk (Hartmann and Wenzelburger, 2021), with

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risk-based judgements evident from initial interactions between police and suspected offenders, during the court process, in incarceration, and through to supervision on probation. Representatives of the criminal justice system with experience and expertise in professional risk assessment utilise complex cognitive processes to support their evaluation and subsequent actions. Heuristic decision-making is routinely used by experts across disciplines to conserve cognitive resources (Tversky and Kahneman, 1974); however, there are inherent risks of bias associated with this more efficient thinking, especially when information is limited or ambiguous (Klein, 2009). Within a probation context, the move to a more standardised approach to risk assessment, and reliance on associated risk technologies, presents the pressure to be accurate risk predictors (Clift, 2012; Fitzgibbon, 2011). As Nash (2005) highlights, ‘the climate in which public protection operates is one that is intolerant of error’ (p. 25). However, errors do occur, with practitioners overestimating or underestimating risk (Kemshall, 2002). The risk of error is higher when compounded by political and societal pressure relating to particular offending cohorts, for example, sexual offenders (Ansbro, 2010; Cohen et al., 2020). Availability heuristics, recency and vividness bias (Kahneman and Tversky, 1972), but perhaps most impactful, risk aversion (Kemshall, 1998) play a key role in assessments. As such, practitioners in the early stages of their careers will require structured and effective training to support their decision-making. Indeed, even expert judgement is not protected from error, with literature from the cognitive psychology domain highlighting issues associated with inflexible thinking, overconfidence and reduced creative problem-solving (Dror, 2011). Accordingly, there is a need for methods to enhance and assess the reliability of decision-making across the continuum of professional experience. The current research focuses on risk assessments in probation practice, specifically in relation to home visit scenarios.

Home visits are a valuable tool at a practitioner’s disposal, enhancing risk assessment practice while simultaneously strengthening the supervisory relationship. They do, however, carry inherent practical, resource, and safety concerns (Ministry of Justice, 2021). It is imperative that the potential costs are mitigated by benefits in relation to reduced recidivism and fewer negative outcomes for both the person under supervision and the community. Nonetheless, understanding of the extent to which home visits achieve these outcomes is limited, particularly when considering their use in probation practice in England and Wales. Research in this area largely stems from the field of social work (Ferguson, 2018) reflecting this practice as part of previous traditional social work values in probation (Dominey and Canton, 2022). This, in part, offers some explanation as to its declining use in probation work over the last two decades, with probation affected by a changing landscape and a new emphasis on the aims of the service. For example, a shift from the welfarist approach of the 1907 Probation Act of ‘advise, assist, befriend’, to the aims of law enforcement and public protection (National Probation Service, 2001), the latter of which showing no signs of relenting with the modern-day probation service functions described as ‘assess, protect, and change’ (HM Prison and Probation Service, 2021). In recent years, barriers to undertaking home visits, such as high workloads and time constraints, have been exacerbated by probation reforms and practice changes within the pandemic; however, we are now seeing a resurgence of its importance for

inspectorate findings and probation guidance (HM Inspectorate of Probation, 2014; HMPPS, 2021). The potential for beneficial outcomes supports the need for continued research to inform evidence-based training and practice that can result in more effective home visit practices and provide invaluable support to the individual under supervision.

As with community interventions more broadly, the framework underpinning risk assessment in probation, and by extension, the purpose of home visits is the risk-needs-responsivity (RNR) model (Andrews and Bonta, 2010). The model suggests that the offenders' risk of reoffending can be assessed, that any intervention must be tailored to individual criminogenic needs, and that the appropriate intensity of intervention should be applied in order to successfully reduce recidivism (Andrews and Bonta, 2007). This highlights one of the key challenges to effective risk assessment, that of the heterogeneous nature of offenders, and has led to the ongoing redevelopment of tools to assist with risk assessment decisions. From the foundation of early risk decisions based on clinical judgement, assessments have progressively focussed on static risk factors, then static plus dynamic risk factors, and most recently, assessments that consider responsivity and case management factors (McAnallen, 2018).

Although risk assessment tools are utilised regularly, the extent to which the conclusions of the assessments actually inform supervision plans can be limited, possibly as a result of a lack of trust in the tools' capacity to accurately assess risk and need (Viglione et al., 2015). Accordingly, experienced probation practitioners place reliance on their own judgement and their subjective perceptions of risk (Ricks et al., 2016). This may result in problematic decision-making for a number of reasons. First, there is a tendency to overestimate risk, perhaps unsurprisingly considering the implications of an offender committing a serious offence while in supervision. Indeed, the concept of risk aversion is a cornerstone of social and psychological research into systematic bias (Kahneman and Tversky, 1972; Tversky and Kahneman, 1974). Second, the practice of over-supervising low-risk offenders presents the possibility of unnecessary cost, but perhaps more importantly, the risk of increasing the likelihood of recidivism (Bonta et al., 2000; Lowenkamp and Latessa, 2004). Third, subjective perceptions relating to specific groups of offenders may result in higher assessments of risk and need. Eno Loudon and Skeem (2013), for example, identified an undue influence of mental illness on decisions, even where the mental health issues were not directly related to the client's individual risk. Such observations raise concerns regarding the cyclical nature of supervision, where increased supervision can lead to increased identification of small violations of the terms of probation, resulting in confirmation bias (Grattet and Lin, 2014). Considering the issues that may arise in risk judgements by even experienced probation practitioners, it is imperative to ensure that those officers in the early stages of their professional practice are provided with effective, evidence-based training. This will support and promote effective risk assessments, and increase appropriate impactful decisions and recommendations informed by accurate assessment of the needs of the person under supervision.

Current risk assessment training for probation officers is underpinned by the Risk of Serious Harm Guidance (HMPPS, 2020). This document outlines best practice in Risk Assessment, taking the RNR principles (Andrews and Bonta, 2007) as key to promoting an evidence-based approach. A four-step approach is promoted, which supports the

assessment of static and dynamic risk factors and the immediacy of risk using a combination of professional judgement and actuarial tools. Training approaches incorporate theoretical and practical components; however, these practical components are largely limited to role-playing scenarios. Role-play scenarios are, however, frequently considered to be unrealistic and artificial (Fineman and Eden, 1981). Compounding this, the impact of the COVID-19 pandemic resulted in a shift to online learning through Microsoft Teams, reducing the opportunity for in-person interactions and practice prior to embarking on a real-world home visit. This article describes an exploratory research project that aims to assess the efficacy of the use of XR technology (an umbrella term encompassing virtual reality (VR), augmented reality (AR), 360° immersive images and mixed reality (MR) technology) in addressing some of these issues.

Increasing interest surrounds the concept of 'digital criminology' (Powell et al., 2018). From the author's perspective, it is key to consider the 'integration of the digital into everyday life' (Powell et al., 2018: 7). In discussing a broad range of applications and considerations, from 'traditional' cybercrime, through social media and the proliferation of hate crime, numerous areas of focus for criminological research and theory are identified. This study shifts away from the study of crime in a digital society, instead looking to exploit the potential for the use of technology to address the requirements of the criminal justice system. Specifically, it looks to examine the application of Extended Reality (XR) technology to forensic settings. XR technology is a term that describes various immersive environments that enable interactions between humans and machines (Kluge et al., 2022). Examples include VR, AR and MR. VR provides a fully-immersive experience, using a head-mounted device (HMD) to allow interactions in a simulated environment and to effectively replace the real world for the user for the duration of the experience (Bailenson, 2018). AR technology typically uses a mobile device to add digital information to the real world. An example of AR technology is *Pokemon GO*. This gaming app uses a mobile device to overlay virtual creatures in the users' real-world location using global positioning system (GPS) tracking. MR is a combination of AR and VR, creating a continuum between the technologies that bring together the digital and physical worlds. Extending the definition of XR technology, Bryson (2013) argues that 360 videos should be incorporated into the included sphere of technologies. 360° video enables the recording of a real-world scenario that can be viewed using a HMD or through a mobile device or laptop, enabling the user to look in every direction in the environment and creating a feeling of 'being there' (Mabrook and Singer, 2019). While less immersive and less interactive (Conroy, 2016; Watson, 2017), it is easier to create and can provide an impactful experience for the user in an accessible and cost-effective way.

To date, discussion related to the use of XR technology to enhance research and practice in the criminal justice system has largely focussed on VR. Ticknor and Tillinghast (2011), for example, provide a review of potential applications for VR, promoting the benefits of increasing experimental control in research efforts, creating a safe and cost-effective environment for rehabilitation and treatment, and exploiting the pedagogic benefits identified with technology-enhanced learning in practitioner training. More recently, Cornet and van Gelder (2020) discussed the potential for the use of VR in improving the predictive validity of risk assessment instruments through the depiction of real-life

scenarios. This can overcome issues associated with memory and imagination and can also allow for the presentation of dangerous or hard-to-access situations. The current research provides a tentative exploration into the benefits of augmenting existing training methods with both VR and 360° immersive video components. Despite increasing evidence supporting the use of VR in training and education (Di Natale et al., 2020), the practical and financial constraints within public sector budgets will need to be considered. Accordingly, the current research aims to compare a fully-immersive experience of a home visit (using VR technology, presented on a Head-Mounted Display (HMD) with a replication of the same property using semi-immersive 360° video). The 360° ‘home visit’ can be accessed remotely using just a laptop computer or handheld device, increasing the applicability and accessibility of the materials. Risk assessment judgements and learner satisfaction measures will be used to assess the effectiveness of the different modes of information presentation. It is predicted, due to the impact of higher levels of immersion and presence in a virtual environment on experience (Brown and Cairns, 2004), that both technologies will be effective in promoting user satisfaction and the achievement of learning outcomes, however, the VR ‘home visit’ will result in greater levels of user satisfaction and the identification of a greater number of risk and protective factors following the completion of the simulated home visit.

## Method

### *Sample*

A total of 23 early career and trainee probation officers participated in the study. Recruitment took place in the South-Central Region of the United Kingdom. Ethical approval was gained from the researchers’ host university Ethics Committee, and appropriate permissions were obtained from the National Research Committee (NRC) to enable access to HMPPS employees. Prior to agreeing to take part in the research, potential participants were provided with detailed information about the nature and purpose of the research, and consent to participate was gained.

### *Materials*

*360° home visit.* In order to create the virtual home visits, a small bedsit (unused student accommodation belonging to the host university) was used to capture 360° images using an Insta360 camera. The bedsit was dressed to reflect the written client report and 10 risk factors (RF) and protective factors (PF) were incorporated into the scene. Some of these were deliberately ambiguous to encourage discourse surrounding why they might be considered to be either a RF or PF (e.g. opened red reminders and a court summons, providing the opportunity to consider whether these were being dealt with or ignored; medication which may or may not be being taken). Once images were obtained and checked for realism (by members of the research team with 30 combined years of experience in conducting home visits as probation professionals), these images were stitched together to create a virtual tour (see Figure 1) using the 3DVista software package. Embed codes, hyperlinks and quick response (QR) codes were created to allow the tour



**Figure 1.** 360° home visit.

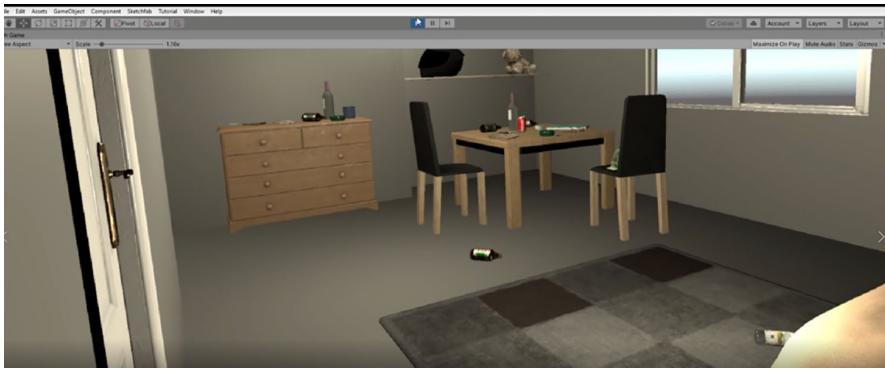
to be shared and accessed through a mobile device or laptop.

*VR home visit.* The VR version of the home visit was created using Unity Pro 2019 and was a replication of the 360° tour. Dimensions and positions of objects were mapped using the Unity Builder to reflect the physical appearance of the bedsit, and the same RF and PF were incorporated into the scene using pre-existing assets available through Unity, or through modelling scanned items using Blender (an online 3D modelling software tool; see Figure 2). The VR home visit was built to be accessed using an Oculus Quest 2 HMD.

### *Procedure*

Gatekeepers at HMPPS were identified to assist with recruitment. For Condition 1, (henceforth, the 360° home visit) posters were displayed in participating probation offices. These provided details about the research and a QR code that could be used to access the data collection tool. The 360° tour was incorporated into a survey tool designed using JISC online surveys. The first page of the survey provided information about the study and consent processes, after which step-by-step instructions were provided for accessing client details (client details are provided in Appendix 1) and the 360° home visit. Participants were asked to imagine they were attending a real home visit, to read the client details and then enter the 360° home visit. They could spend as much time as they liked in the home and were instructed to assess any risk and protective factors present to enable the completion of a subsequent risk assessment. After leaving the 'home visit', they were automatically returned to the survey, which asked for details about their identification of RF and PFs and of their decision-making in relation to any recommended actions for the person on probation. They were also asked to reflect on their





**Figure 2.** VR home visit.

experiences of using the virtual tool. At the end of the survey, participants were required to submit their answers to reconfirm consent to participate and thanked for their time.

Condition 2 (henceforth, the VR home visit) required the researchers to visit probation offices for the purpose of data collection. Participants had to volunteer for this condition due to access limitations and the need to align with current work commitments. Gatekeepers provided information about the research to potential participants, and those who agreed to participate were invited to attend the data collection room at a time convenient to them. At this point, the researchers gained written informed consent, and instructed participants on the use of the VR equipment. As above, participants were asked to treat the virtual home visit as if it were real, and to follow the same process as outlined earlier. They were provided with the same client details used in the 360° home visit, and after reading this were given the opportunity to explore the VR home visit. Once participants were satisfied, they had explored the virtual environment sufficiently, researchers removed the VR equipment and guided participants to a laptop to access the same survey as used in the 360° home visit. After completing the survey, participants were thanked for their time and given the opportunity to ask any questions.

## Survey

Questions were identical for both conditions. The survey consisted of three sections:

Section 1 asked participants to outline any previous completed training programmes relevant to risk assessment and/or home visits, and whether the participant had taken part in any real-world home visits.

Section 2 provided the client case details and links to the home visit. For the 360° home visit condition, a link to the 360° video of the client's home was provided. Client details were embedded into the tour (an icon on the door of the property requested that participants click on and read the client details before entering the

property). For the VR home visit condition, this section of the survey included the client details, and after participants had read these, the researchers assisted participants in accessing the VR home visit.

Section 3 asked participants to list the risks and protective factors identified for the presented case and to explain why they felt these to be relevant to the risk assessment. They were asked to describe their risk assessment decision-making, and to identify any actions and recommendations for follow up. Finally, participants were required to reflect on the usefulness of the home visit scenario for understanding good practice in risk assessment and home visits.

## Analysis

Ten risk and protective factors (these were selected based on discussions with two experienced Probation Officers) were incorporated into the client case details and home visit scenarios. Participants were allocated a score relating to the number of these factors that they identified. Additional risk and protective factors considered by participants were also coded and added to the overall score. Content analysis was used to identify patterns in risk assessment judgements and decisions, and illustrative quotes were identified to add depth to the discussion of the risk assessment judgements between conditions.

## Results

Previous training undertaken by participants consisted of risk workshops ( $n=2$ ), OASys training ( $n=9$ ), RoSH training ( $n=4$ ), SARA training ( $n=1$ ) and AARMS training ( $n=1$ ). Most of the training was live taught ( $n=13$ ), however, as a result of the COVID-19 pandemic, six participants reported a mixture of e-learning, face-to-face training and training using conferencing software ( $n=6$ ) or e-learning alone ( $n=2$ ). Nine participants said that they had had specific home visit training (14 participants had not); however, 17 participants had been provided with the opportunity to observe a home visit conducted by a more experienced colleague. Observation of practice was ( $n=15$ ) considered to be the most valuable method for developing learning in relation to risk assessment, with official training also being mentioned by 10 participants.

The most commonly reported purpose of a home visit was to identify risks as they occurred within the home ( $n=20$ ) and to observe interactions between the client and important others in their lives ( $n=9$ ). This was considered to have beneficial outcomes compared to the more removed location of the probation office. Home visits were also noted to allow for the development of rapport with the client and family ( $n=5$ ). Increasing compliance and checking residency were also mentioned as a key function of home visits ( $n=5$ ).

The average number of RF and PF (as categorised as risky or protective by the participant, including both those placed in the scene and additional RF and PFs identified by participants) were calculated. Independent samples  $t$ -tests were conducted to compare means. No significant difference was found in the number of RF identified,  $t(21)=-0.185$ ,  $p=0.974$ , although participants in the VR home visit condition identified more RF



( $M=5.92$ ,  $SD=2.66$ ) than those in the 360° home visit condition ( $M=5.17$ ,  $SD=3.13$ ). No significant difference was found between the number of PF identified,  $t(21)=0.222$ ,  $p=0.271$ , with those in the 360° condition identifying a mean of 2.2 PF ( $SD=1.55$ ) and those in the VR condition identifying a mean of 2.08 PF ( $SD=1.12$ ). Despite a greater number of RF and PF identified by participants in the VR condition, the number of words used in explaining the relevance of these was significantly greater for participants in the 360° condition ( $M=270.4$ ,  $SD=256.82$ ) than for the participants in the VR condition ( $M=222.77$ ,  $SD=153.39$ ),  $t(21)=.554$ ,  $p < 0.05$ .

All participants stated that they had identified a number of issues that they would like to follow up in discussion with the client. Of greater concern to participants was the client's relationship with alcohol ( $n=20$ ), followed by questions surrounding the presence of a teddy bear in the home ( $n=15$ ). Financial issues ( $n=14$ ) and compliance with medication ( $n=11$ ) were also mentioned as topics to be discussed, as were relationships and friendships ( $n=8$ ), betting and gambling ( $n=8$ ), and food choices and availability ( $n=6$ ). No differences were observed in the specific RF or PF identified between conditions, although the 360° condition was more likely to be considered unkept or dirty ( $n=7$ ) than the VR condition ( $n=1$ ).

Actions to be taken following the home visit reflected the risks identified, and the discussion topics above. Agencies that were identified for referral were alcohol services ( $n=14$ ), drug services ( $n=12$ ), social care services ( $n=10$ ), the police ( $n=6$ ), financial advice services ( $n=5$ ), gambling support ( $n=4$ ), and the client's general practitioner (GP) ( $n=3$ ). Participants in the VR condition suggested a greater number of referrals ( $n=40$ ) than those in the 360° condition ( $n=28$ ). This reflected the notionally greater number of risk factors and issues to be discussed identified by the participants who experienced the VR home visit.

When asked to reflect on the useability and value of the presentation of the home visit, reports were overwhelmingly positive for both the 360° and VR conditions.  $N=7$  of participants who experienced the 360° home visit, and  $n=11$  of those who navigated the VR condition stated that this would be a useful addition to existing training:

I think it's incredibly useful and more useful than training I have completed myself to do with risk management, so many of the training events I have done involve case studies, but case study after case study doesn't feel real, and people don't find themselves getting a lot out of them, whereas the 360 view interactive way of doing it is far more inviting to trainees. (PPT008, 360° condition)

The opportunity to practice a risk assessment before embarking on a real-world assessment was considered to be a valuable addition:

Really good. Liked being able to be tested about Home Visits in a safe environment, especially due to there being nothing surrounding this currently. (PPT10, 360° condition)

The opportunity to engage in practice-based learning was also a benefit that participants identified as being conducive to their personal learning style:

Very useful, my training has been case study and teams discussion. To see something in real life helps to learn from experience which suits my learning style. Practice based thing is interesting, and [I] liked it and think it is better than talking about [home visits]. (PPT013, VR condition)

Finally, participants in both conditions made positive comparisons between the technology-enhanced home visit experience and the more traditional case study and role-play methods for teaching risk assessment in home visits:

I have walked into a makeshift room with a SPO [Senior Probation Officer] pretending to be an offender which is extreme. This is much more realistic, can have time to walk around . . . (PPT014, VR condition)

## **Discussion**

. . . the training was amazing, very good experience (PPT015, VR condition)

The aim of this research was to explore the potential of incorporating XR technology into existing risk assessment and home visit training in the probation context. The rationale for this focus was to provide a starting point for the development of an evidence-based training simulation to address existing limitations in the current risk assessment and home visit provision. Increasing focus on the capacity for VR to enhance learner outcomes (e.g. Ticknor and Tillinghast, 2011), combined with research indicating the possibility for improving the predictive validity of risk assessment (Cornet and Van Gelder, 2020) show great promise for the application of VR in this context. The predicted beneficial outcomes must, however, take into account the considerable practical, temporal, financial and environmental constraints that will inevitably influence the feasibility of any training programmes on a broad scale. To address this concern, the current research aims to compare learner outcomes and satisfaction following the completion of a virtual home visit presented using (a) semi-immersive 360° technology and (b) fully-immersive VR. Any enhanced outcomes predicted as a result of the more immersive VR experience will be discussed in relation to the benefits of increased accessibility and flexibility provided by the semi-immersive 360° home visit.

When reviewing the literature surrounding home visits, a key concern was the lack of knowledge about the specific role of home visits in probation practice, and how to ensure that they provide an effective approach to reducing recidivism (Ahlin et al., 2013). Current practical training involves the use of role-play and shadowing home visits conducted by more experienced colleagues. Participants reported that the opportunity to observe real-world home visits was a preferable approach to learning than role play in a training situation. They also reported that they were surprised as to how realistic they found both the VR and 360° conditions in this study. This may indicate the possibility that the use of immersive technology could bridge the gap between role play and direct observation. A realistic simulated environment offers the benefits of introducing trainees to the practicalities of conducting a home visit in a safe and replicable environment:

[I] like the idea about being able to simulate home visit without first one being the real thing; would be stressed on first home visit. VR creates an opportunity to experience . . . can create a secure situation where people can take attention to the details. (PPT015, VR condition)

Interactions in the simulation can be observed by peers and tutors allowing for swift written or verbal feedback. They can also be recorded, to support self-reflection, peer reflection and trainer feedback (see Cobbold and Wright, 2021, for a review on the value of formative feedback for enhancing performance).

In describing decision-making in the VR home visit condition, one participant indicated that he would not cross the threshold of the property in order to conduct his risk assessment, citing concerns for his own personal safety. This reflects the observations of Meredith et al. (2020) and very real concerns of both the UK and US probation service (see, for example, Lindner, 1992). The use of simulated environments allows for the inclusion of not only risk factors for offending but also risks that may be inherent in the undertaking of a home visit. Training surrounding the identification of such risks and methods to protect against harm would be a valuable addition, again allowing trainee probation officers to practice the delicate balance between protecting themselves and engaging sufficiently with the home visit in order to make an accurate assessment of recidivism risk.

An interesting discussion that emerged from the observation of participants in both virtual environments arose from the placed ambiguous items, but also from incidental placement of typical items around the home. The inclusion of a child's toy in the home led many participants ( $n=15$ ) to question the presence of a child, prompting safeguarding concerns. Conversely, a small number of participants ( $n=2$ ) suggested that the toy might indicate that the client was in a relationship with someone who had a child, and noted that an appropriate relationship could be a protective factor. Similarly, the majority of participants ( $n=15$ ) regarded evidence that the client was corresponding with his mother to be a protective factor, however, three participants were concerned about this, again noting safeguarding issues for the elderly parent. A third example emerged from the attempts of the researchers to simulate a slightly chaotic and untidy feel to the home. Dirty plates and other food items were scattered around the kitchen, and (alongside empty alcohol bottles), a plate had been placed on the floor. Rather than taking this as an indication of poor housekeeping habits, two participants asked if the client had a pet, again, indicating that this could be a protective factor. This observation was entirely unexpected from the perspective of the researchers, however, provides an excellent example of how observation of practice can prompt important reflections that would likely not arise without such visual representation of the scenario. As noted by Eno Loudon and Skeem (2013), and in line with the work of Dror (2011), individual bias and misconceptions can lead to inaccurate assessment of risk, however, the capacity to observe and reflect on decisions in a training context provides valuable opportunity to identify and challenge assumptions and decision-making that arise spontaneously when placed in a home visit scenario.

While no significant difference was found between the number of RF and PF identified in the 360° compared to the VR condition, more discourse arose from the 360°

condition. This is an encouraging, but unexpected finding in support of the use of this more accessible virtual option. Previous research (Meenaghan et al., 2018) highlights that the use of VR in offender decision-making research has the capacity to enhance and increase the amount and type of information provided about decision-making after completion of a virtual task. It is reasonable to assume that the more immersive the simulation the greater such effect might be. In the gaming world, immersion is key to how realistic the virtual world is perceived, and to how engaged gamers are with the simulation (Brown and Cairns, 2004). In this study, the details emerging from the less immersive 360° simulation were not noticeably affected compared to the fully-immersive VR version. While any conclusions drawn from the current research are inevitably tentative due to the small sample and relatively limited nature of the simulations, it may be that (in line with considerable ethnographic research promoting the value of still images and objects to increase disclosure and detail in interview, for example, Chiozzi, 1989; El Guindi, 1998), the 360° video provided sufficient visual prompts to achieve similar results for risk assessment decisions.

The final observation from the decision-making observed and recorded in this research relates to the large number of agencies identified for further intervention following the home visit. Services identified were social care, mental health, alcohol and drug misuse, financial advice, gambling support, GP and the police. The client details and risks within the property arguably did not support such a stringent response, which may be reflective of the tendency towards over supervision (Fitzgibbon et al., 2010). This is another area of risk assessment decision-making that could be challenged through the use of technology-enhanced training in probation education.

### *Limitations*

The key limitation of the current research was the small sample size and relatively limited nature of the simulation. For the purpose of the current aims (an exploratory study to guide the development of a future training package for risk assessment in home visits), the findings were very encouraging. Future research to refine the simulation, to include feedback and reflective components, and to incorporate various combinations of static and dynamic risk and protective factors will continue to guide the ongoing development of an evidence-based, technology-enhanced training provision.

In line with the work of Hyatt and Barnes (2017), participants indicated that one of the most important goals of the home visit was to build rapport with the client and their family. Home visits offer the opportunity to observe interactions between the client and the environment, as well as between the client and others living in and around the home. The current simulation did not allow for this as avatars were not included, however, this would be a valuable addition for future simulations. The value of this is summarised in the questions of participant 11: 'Where is Toby? Where is he sitting? What is his demeanour? How is he dressed?' At the time of developing the simulation, the cost and practicalities of creating a realistic and interactable avatar for the current research were prohibitive, however, the rapid technological development of this aspect of software development means that this is a realistic possibility for the very near future.

## Conclusion

The small-scale study reported here shows exciting promise for the ongoing development of training simulations that incorporate XR technology and 360° video. In this way, it provides additional support for the assertion of Powell et al. (2018), that digital criminological research offers great potential for advancing criminological research and theory. It is imperative that any enhancements are fit for purpose, and that they reflect the training needs of both the probation context and the learners. Knowledge gaps and training requirements must be addressed in a reflexive manner, and the careful development of simulated environments that can be adapted and adjusted in accordance with learner and tutor reflections may provide an invaluable addition to existing training methods. In addition to the opportunity to uncover unconscious bias and provide ongoing formative and summative feedback, the use of simulations enables repeated practice of hard-to-access and potentially risky scenarios. It also allows decisions to be considered in a less-pressured environment. The capacity to provide remote, practical learning shows great potential, with environmental benefits and increased accessibility for learners with disabilities or personal responsibilities that make travelling to a distant training site difficult. It allows for more opportunities for observation of practice, providing a level of resilience that is all too appreciated in the wake of a global pandemic. Alongside providing invaluable opportunities for learning in early career probation officers, the current exploratory research shows significant potential for increasing learner satisfaction, confidence and accuracy in their risk assessment and home visit practices with benefits for probation learners, those being supervised and the community as a whole.

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### Author biographies

Amy Meenaghan is a Senior Lecturer and Programme Area Leader in the School of Criminology and Criminal Justice Studies at the University of Portsmouth. Her research interests include decision-making and offender behaviour, and the use of immersive technologies in education, training and research.

Michelle McDermott is a Senior Lecturer and Programme Area Leader for the academic component of the professional qualification in probation (PQiP). Michelle is a qualified probation officer with extensive experience in training probation officers. Her research interests include the professional development of practitioners and risk-based decision-making.

Laura Haggart is a Lecturer in the School of Criminology & Criminal Justice at the University of Portsmouth. Laura is a qualified probation officer and has previously taught on the probation training programme. Laura's research interests include women in the justice system, desistance and probation practice.

## Appendix I

### *Fictional client case details*

# Client Details

Toby Lincoln

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**AGE:** 46 years

**Gender:** Male

**Ethnicity:** White British

**Sentence:**

Imprisonment for Public

Protection: Tariff 18  
months

*Offence details: Robbery.* Toby entered a bookies wearing a crash helmet to conceal his face. He demanded money from the cashier by pretending to have a gun, using his fingers inside his pocket to imitate the shape of a weapon. While the cashier believed he posed a credible threat she still managed to raise the alarm which led to Toby being locked in the premises where police arrested him.

*Offending history.* Previous offences of ABH, assaults against security staff and police. Significant number for acquisitive crime – burglary and theft.

*Pertinent information.* Toby has a long history of amphetamine use. He has also had periods of time where he has been alcohol dependent. Toby has been diagnosed with schizophrenia for which he is medicated. At the time of the offence, Toby's amphetamine use was at its highest. He was not engaging with the mental health team or maintaining his medication and he had lost his accommodation. Toby described how he felt 'out of control' and was sofa surfing where he could. He was struggling financially and had borrowed money from known offenders. The offence was a desperate attempt to gain money for drugs.

Toby is an only child. His father died when he was young. Due to financial hardship his mother had to work numerous jobs to pay bills, often leaving Toby alone or with neighbours.

By his early teenage years, Toby stopped attending school and would spend his time drinking with older peers. Later, this involved stimulant drug use. He left school at the age of 14, without any qualifications. He became estranged from his mother, leaving home at 16 years.

Over the following 20 years, Toby was convicted of numerous acquisitive offences which he committed primarily to fund his drug use. As his drug use escalated so did the volume of offending, which led to a series of short-term custodial sentences. Toby's longest custodial sentence prior to the index offence was a 2-year sentence for ABH. The circumstances of which related to Toby paying off a drug debt by 'enforcing' the debt of another drug user.

Toby has had two previous serious relationships, but no children. He had a period of relative stability while in his second serious relationship. This relationship ended 18 months prior to the index offence. He has made no disclosures in relation to current relationships.

While Toby was estranged from his mother throughout most of his adult life, during his custodial sentence he and his elderly mother started writing to one another.

Toby has a limited employment history, although he is interested in mechanics, particularly fixing old bikes. Toby has been spending time working on helping to restore an old bike for one of his neighbours.

Toby was over tariff by 2 years when his release was directed. Following a brief stay in an Approved Premises Toby moved into independent accommodation that was sourced by his mental health support worker. This course of action was discussed and agreed in the oral hearing that directed Toby's release. Toby has been living in his home for the last 6 months.

He has presented to appointments in good spirits of late and appears optimistic about his future.