Reducing dehumanisation through virtual reality: prospects and pitfalls
Harry Farmer*

This paper presents evidence that Virtual reality (VR) has the potential to reduce dehumanisation via a range of different routes, notably the experience of being present in a situation with outgroup members, experiencing virtual contact and interaction with the outgroup and taking on the perspective or even body of an outgroup member. In addition, it hightlights key questions that require future research, including the strength of empirical evidence that VR can indeed reduce dehumanisation, the mechanisms by which such a process occurs and the ethical issues in treating VR as an 'ultimate empathy machine'.

Address
School of Human Sciences, Institute for Lifecourse Development, University of Greenwich, UK

Corresponding author: Farmer, Harry (h.farmer@gre.ac.uk)
* Twitter account: @PsychFarmer

Introduction

New communicative technologies broaden our perception of humanity. The rise of the popular novel in the late 18th century has been linked to the development of human rights and the abolition of slavery [33,62]. Similarly, cinema gives insights into the lives of others, earning the title 'empathy machine' by film critic Roger Ebert [66]. Virtual reality (VR) has advanced impressively in the last decade, and its increased sense of immersion has led some to call it the 'ultimate empathy machine' [8] that could help reduce the dehumanisation of stigmatised groups [86].

Dehumanisation involves the denial of human characteristics to other humans, particularly those in different social groups (for a recent review see [41]). Various taxonomies of dehumanisation have been proposed. Haslam [27] distinguished between two forms of dehumanisation involving the denial of either human nature (mechanistic dehumanisation) or of uniquely human characteristics (animalistic dehumanisation). Other researchers highlighted infrahumanisation, a more subtle variating of dehumanisation in which members of an ingroup are perceived as possessing more uniquely human traits than do outgroup members [78]. Other researchers have placed additional phenomena such as objectification and demonisation within the umbrella of dehumanisation [43].

It is important to note at the outset that at present, only a few studies have directly linked VR with the reduction of dehumanisation itself. Therefore, this review will cast a wider net, highlighting studies that have shown that VR can impact factors distinct from but closely linked to dehumanisation, for example, attitudes towards the outgroup [11] and empathy [70]. I will also highlight studies using VR to facilitate experiences that are known to reduce dehumanisation, for example, intergroup contact, social categorisation and human–animal similarity [81].

This paper will outline three VR techniques that have the potential to reduce prejudice and increase humanisation towards commonly dehumanised outgroups. These techniques, in order of their level of immersion, are 1) giving users the experience of being 'present' in the lives of members of a social outgroup [72]; 2) affording virtual contact with outgroup members [54] and 3) the use of sensorimotor synchronisation to produce the feeling of embodying the member of a social outgroup [21].

Experience of presence

First, VR can reduce dehumanisation by creating a strong sense that the user is 'present' in a situation related to the dehumanised group. This sense of presence is defined as the subjective feeling that the user is located in the virtual environment that VR presented to them [72]. When the virtual environment contains other people, this sense of presence takes on a social aspect relating the user to those depicted [55]. This approach often takes a documentary format, utilising 360° cameras to record real-world scenes that can be viewed via head mounted display (HMD) (360VR, [45]). The photo-realistic nature of this VR form results in a high level of immersion, along with a sense of truthfulness and

immediacy lacking in computer-generated virtual environments [16]. However, the user's inability to genuinely interact with the subject of the piece limits their sense of presence as they become a passive observer [37].

Several studies suggest that 360VR can increase empathy towards the subject, despite the limitation of user interaction. Empathy here is treated the ability to share (affective empathy) and understand (cognitive empathy) the thoughts and emotions of others [83]. For example, Schutte & Stilinović [68] showed participants the 360VR documentary 'Clouds Over Sidra' [82], which details the daily life of Sidra, a young Syrian refugee. They found that those who viewed the documentary via an immersive HMD reported greater empathy for her than those who watched it via a 2D screen. Shin [69] demonstrated the importance of presence to this effect. When users viewed 360VR content within an immersive HMD, higher levels of subjective presence predicted increased empathy towards child refugees, the documentary subject. Cummings et al. [18] reported a similar finding, with two subcomponents of presence, self-location and sense of copresence predicting participants' levels of affective empathy, while only sense of copresence predicted cognitive empathy. Additionally, a recent study found that higher social presence in the 360VR scenes in a documentary on climate refugees predicted greater empathic concern, and empathic concern mediated the relationship between social presence and prosocial behaviour [61].

Virtual contact with the outgroup

The second way that VR could be used to reduce dehumanisation is by facilitating virtual contact with outgroup members. Positive intergroup contact has been shown to be a powerful method for reducing prejudice towards social outgroups [59] and has also been shown to humanise participants' perceptions of outgroup members and has also been shown to have a specific role in humanising participants' perceptions of outgroup members [10]. Capozza et al. [13] demonstrated a bidirectional link between dehumanisation and contact with lab-based approach behaviours. However, intergroup contact can be a double-edged sword, with negative contact increasing prejudice at a higher rate than positive intergroup contact decreases it [31,4]. Other research has highlighted the importance of equal status between groups during intergroup interactions [39,48]. In addition, intergroup conflict, segregation and psychological barriers can all act to reduce situations in which positive face-to-face contact occurs [35].

Difficulties in promoting positive face-to-face intergroup contact have sparked interest in indirect social contact, such as imagined [17] or vicarious contact [38]. These forms of indirect contact have been proven effective in reducing prejudice [19,35] and outgroup dehumanisation [63,81]. VR's high levels of immersion and interactivity allow users to interact with outgroup members without needing to be physically or temporally co-present in a new form of indirect contact [54].

Although no studies have directly examined the effect of virtual contact on dehumanisation, there is considerable evidence that VR contact can lead to more positive appraisals of outgroup members. For example, Breves [9] found that helping a black virtual character led to a greater reduction in explicit prejudice when the interaction occurred in VR compared with a traditional 2D format. Hasler et al. [28] showed that when Israeli participants interacted with a Palestinian virtual character whose posture mimicked their own, this increased their feelings of sympathy and closeness towards the virtual character. Recently, Tassinari et al. [77] manipulated whether participants interacted with an ingroup or outgroup avatar in a virtual environment and found that, in the outgroup condition, levels of social presence predicted situational empathy. However, some of the moderating influences identified for direct contact can also apply to virtual contact. For instance, a recent study found that VR contact had positive effects on empathy and social proximity towards people with schizophrenia only when participants reported a positive assessment of the person they encountered [73].

Virtual embodiment

The final technique through which VR might reduce dehumanisation is by immersing users within the experience of being a member of a dehumanised group. This approach can be achieved through virtual perspective-taking or virtual embodiment. Virtual perspective-taking allows users to experience the perspective of the other group through 360VR or computer-generated environments, either by locating the viewpoint next to group members or within their bodies. Virtual perspective-taking has been found to increase positive attitudes towards stigmatised groups, including homeless people [84] and dementia sufferers [49,85]. Herrera et al. [32] directly tested the effect of virtual perspective-taking on the dehumanisation of homeless people and found that it was more effective than more traditional perspective-taking methods in reducing dehumanisation over time. Hasson et al. [30] found that Israeli participants who viewed a confrontation between Israeli soldiers and a Palestinian couple from the Palestinian perspective showed increased empathy towards the Palestinian couple, increased moral condemnation of ingroup actions and decreased dehumanisation of Palestinians in general.

Virtual embodiment involves using multisensory or sensorimotor contingencies to create a sense of body

ownership over a virtual avatar of an outgroup member. Early studies used techniques such as the rubber hand illusion [22,23,46] or the enfacement illusion [24] that used synchronous visuotactile stimulation to induce a feeling of body ownership over a particular body part (hand or face, respectively) belonging to a different racial group. These studies found that experiencing body ownership led to a reduction in implicit racial bias. In VR, users can embody avatars across different ethnicities, gender ages or even species, thanks to the computer-generated virtual environments and motion tracking that allows for sensorimotor synchrony between users' real body and their virtual avatar.

To date, virtual embodiment studies have not directly measured its effect on dehumanisation. However, many studies have shown positive effects from embodying avatars of different ethnicities, including a reduction in implicit bias [3,58], increased helping behaviour towards black virtual characters [40], increased signals of affiliation such as postural mimicry [29] and greater neural signals of empathy to outgroup pain [26]. Similar reductions in implicit bias have been found when embodying both children [2] and elderly people [56]. For gender, some studies show reductions in gender bias after embodying a female avatar [25,75], while others find the opposite effect with gender bias increasing post embodiment [44,67]. Another recent study showed that participants who embodied a drug user in full VR showed increased empathy towards drug users and that this was mediated by perceived closeness between themselves and the embodied avatar [14].

A less obvious way that virtual embodiment might reduce dehumanisation is by increasing the perception of human–animal similarity. The interspecies model of prejudice [15,74] suggests that increasing the perception of similarity can reduce outgroup dehumanisation by bringing non-human animals into the domain of moral concern. Existing VR experiences have shown that creating a sense of ownership over animal bodies can increase pro-environmental attitudes [1,60], but it is unclear whether this method can reduce dehumanisation of social outgroups.

Key questions
I will now highlight three key questions regarding the use of VR to reduce dehumanisation. The first relates to the effectiveness of VR when compared with other, potentially more affordable options. The relative novelty of VR means that there are few studies examining the effect of VR on attitudes towards outgroups and even fewer on dehumanisation specifically. Additionally, many studies in VR research have low statistical power and poor transparency, making replication challenging [42]. Meta-analyses have attempted to test the effects of VR on social attitudes. Ventura et al. [80] found that VR

interventions did not significantly increase empathy, but this analysis only consisted of seven studies. In contrast, a more recent meta-analysis containing 43 studies suggests that VR is effective in eliciting affective but not cognitive empathy. Nikolaou et al. [47,53] conducted a wider meta-analysis of the effectiveness of VR in changing social attitudes and found that VR was more effective than less immersive interventions in changing social attitudes, with outgroup perspective-taking being particularly effective. However, they failed to find evidence of a greater effect for embodied interventions. These results highlight the importance of considering how different forms of VR, with different levels of immersion, might vary in their effectiveness in combating dehumanisation [79].

A second issue is that the mechanisms through which VR-based interventions change attitudes towards the dehumanised group are unclear. Such interventions often contain multiple aspects, for example, mixing virtual embodiment with virtual contact [57], making it likely that multiple pathways linking dehumanisation, empathy and other factors might be involved. One possible mechanism for how virtual embodiment might reduce dehumanisation is by increasing the association between the self and the dehumanised group, leading to a positive self-evaluation that is transferred to that group [7]. Increasing the perceived closeness of outgroups to the self outside of VR has been found to decrease dehumanisation [87,88]. Recent results support this pathway by showing that embodying a specific person after learning about their personality traits leads participants to shift their assessment of their own personality traits to be closer to that of the embodied person [65,76].

A final issue is the concern, raised by several researchers, that by relying on immersion to generate empathy towards outgroups, VR risks further dehumanising its subjects. Nash [51] frames this in terms of creating an improper distance between the user and subject of VR documentary, while Nakamura [50] highlights the 'toxic empathy' of seeking to experience another's life and suffering as a form of entertainment. Empirical support for this position comes from a recent study demonstrating that high ratings of enjoyment after watching 360VR led to decreased empathic concern for the documentary subjects [5]. Such findings highlight the need to consider that extent to which VR content risks 'gamifying' the suffering of disadvantaged groups leading to a backfiring of any humanising intentions. A related concern is that some forms of VR, which involve users choosing whether to inflict harm to others, may lead to personal distress and both other and self-dehumanisation [64].

One area that might provide insights as to when and how VR is likely to reduce as opposed to increase dehumanisation is research on dehumanisation in non-VR video games,

which share the interactivity of VR. Several studies suggest that violent games lead to an increase in dehumanisation [36,6], a fact that is particularly worrying given that the targets of Western video game violence are often outgroup members such as Arabs [20,34]. Other research has linked the oversexualised portrayal of women in video games to dehumanising attitudes and online abuse [12]. These findings highlight the importance of avoiding stereotypical portrayals of social groups within VR experiences.

When it comes to avoiding giving users an improper sense of distance with those they are encountering or embodying, a recent paper from Slater and Banakou [71] outlines the 'Golden Rule Embodiment Paradigm' (GREP) for VR embodiment in which the participant first embodies an avatar in a scene in which they are complicit in causing harm to an outgroup member, for example, as part of a group of men catcalling a woman [52] or as a member of the police witnessing police brutality [40]. The participant then reexperiences the same scene while embodying the outgroup member, viewing their previous behaviour from this new perspective. The authors present evidence that such an approach increases prosocial behaviour towards the outgroup, but argue that by focusing on the participant's own past behaviour, this approach avoids the risk of improper distance and 'toxic empathy' that occurs when one is merely a passive observer of another's suffering. While to date no study has directly investigated the effect of GREP on dehumanisation, it seems plausible that this approach will mitigate some of the concerns raised in treating VR experiences purely as a means of observing the distress of others.

Conclusion
In conclusion, this paper has presented evidence that VR has the potential to reduce dehumanisation via a range of different routes, notably the experience of being present in a situation with outgroup members, experiencing virtual contact and interaction with the outgroup and taking on the perspective or even body of an outgroup member. Several ongoing questions have been highlighted that require future research, including the strength of empirical evidence that VR can indeed reduce dehumanisation, the mechanisms by which such a process occurs and the ethical issues inherent in treating VR as an 'ultimate empathy machine'.

Declaration of Competing Interest

The author declare that there is no conflict of interest.

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