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The Golden Rule for Fostering Prosocial Behavior with Virtual Reality

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Abstract

The Golden Rule of ethics in its negative form states that you should not do to others what you would not want others to do to you, and in its positive form that you should do to others as you would want them to do to you. The Golden Rule is an ethical principle, but in virtual reality (VR) it can also be thought of as a paradigm for the promotion of prosocial behavior. This is because in VR you can directly experience harm from a victim's embodied perspective that you had inflicted or were complicit in inflicting on that victim. This use of what we refer to as the Golden Rule Embodiment Paradigm (GREP) relies on participants in VR having the illusion of body ownership over a virtual body. In this paper we will introduce virtual embodiment and the consequent illusion of ownership over the virtual body, and describe how this has been utilized to influence implicit attitudes. We will then extend this to introduce the GREP and give examples where helping behavior was enhanced.

Keywords

Virtual reality, body ownership, Golden Rule, implicit bias, prosocial behavior

Abbreviations

VR: Virtual Reality

GREP: Golden Rule Embodiment Paradigm

HMD: head-mounted display

RHI: Rubber Hand Illusion

IAT: Implicit Association Test

Introduction

The concept and indeed first implementation of Virtual Reality (VR) date from the 1960s (Sutherland, 1965). The fundamental idea is that human participants act in a surrounding digital world with computer generated multisensory input continuously updated as a function of participant actions. For example, a head turn should result in the real-time update of what is seen with concomitant changes to the perception of sound. This is typically achieved through the participant wearing a head-mounted display that delivers ideally wide field-of-view stereo high resolution visual output as a function of real-time head tracking, and binaural auditory output. The participant can select and move objects through real-time hand tracking, should feel objects that are touched, and be subject to force-feedback on collisions with virtual objects via haptic interfaces. This remains an ideal that has been partially achieved, mainly with respect to visual and auditory modalities, though there are a variety of haptic interfaces. In the late 1980s and 90s there was tremendous interest in VR sparked by new hardware developments and powerful computer graphics engines, available to a few University research labs and some companies, limited due to expense and the significant specialized computer graphics parallel processing hardware required. Over the past 10 years, largely through cellphone-based hardware developments, VR has moved out of the lab to become a highly portable lightweight consumer product, at costs equivalent to a Smartphone, at least two orders of magnitudes cheaper than a decade ago.

The past three decades have seen a huge amount research devoted to the utilization of VR in various fields not least to psychology (Slater & Sanchez-Vives, 2016). For example, Blascovich et al. (2002) and more recently Pan and Hamilton (2018) proposed VR as an excellent tool for studies in social psychology since it provides the possibility for internally valid experimental designs, with the experimental scenario under full control. Moreover, scenarios that are impossible in physical reality for practical or ethical reasons can be studied in VR, with a high degree of external validity. This is because decades of research on presence (the illusions of ‘being there’ and that virtual events are real) has shown that participants tend to respond realistically to virtual situations and events (Sanchez-Vives & Slater, 2005). For example, using VR it has been once again possible to study various aspects

of Stanley Milgram's obedience to authority paradigm, with a recent study reported by Gonzalez-Franco et al. (2018).

In this paper we concentrate on applications of virtual *embodiment*. Embodiment consists in substituting a person's actual body by a life-sized virtual one that is spatially coincident and aligned with their real body as seen from their first-person perspective. When participants wearing a wide field-of-view head-tracked stereo head-mounted display (HMD) delivering VR look towards their own body they will see a life-sized virtual body visually substituting it. Similarly they can see their virtual mirror image in reflective surfaces. If it has been so programmed the virtual body will move synchronously and in correspondence with real body movements based on data from real-time motion capture. Additionally when an object is seen to strike the virtual body a corresponding tactile sensation can be felt on the real body if the apparatus for this has been set up. Such embodiment can lead to the subjective illusion of *body ownership* with respect to the virtual body. Body ownership refers to the feeling that an extraneous body part is part of one's own body or a whole body is one's body. This is an illusory *feeling* to be distinguished from knowledge (e.g., the kidney is known to be part of the body but this is not felt, for example, compared to an arm) (De Vignemont, 2011). Gallagher (2000) defined body ownership (with respect to the real body) as "The sense that I am the one who is undergoing an experience. For example, the sense that my body is moving regardless of whether the movement is voluntary or involuntary." When it comes to extraneous body parts (for example, a dummy or virtual arm) we rephrase this as being the feeling that the arm I see moving, or see and feel being touched, is my arm (even though I know that it is not). Blanke, Slater, and Serino (2015) showed that there are a number of contributors to this: constraints signaling the location of body parts and the whole body in space through proprioceptive and vestibular signals in peripersonal space (within reach of the body), visual depiction of the body, and prolonged multisensory stimulation that provides confirmatory evidence regarding the disposition of body parts or the whole body. These constraints are met by virtual embodiment. For example, the participant in VR looks down towards themselves and sees the virtual body instead of their own therefore providing proprioceptive and vestibular cues in peripersonal space (through the act of looking down), visual cues (they see a body where their normal body would be seen), and further multisensory evidence (they move their body

and see the virtual body move, visuomotor synchrony) or they see something touch their virtual body and feel a corresponding tactile sensation (visuotacile synchrony).

A prime inspiration for the malleability of body ownership is the Rubber Hand Illusion (RHI) introduced by Botvinick and Cohen (1998). This showed that synchronous tapping and stroking on a subject's real out-of-sight hand, and a seen rubber hand in an anatomically plausible position on a tabletop, will lead to the illusion of ownership over the rubber hand. This same principle has also been applied to a manikin body seen through a HMD as substituting the subject's body (Petkova & Ehrsson, 2008) and over a virtual body (Slater, Spanlang, Sanchez-Vives, & Blanke, 2010). Visuomotor synchrony also leads to the ownership illusion over a whole body without the necessity for additional visuotacile stimulation, for example as shown by Banakou and Slater (2014).

Yee, Bailenson, and Ducheneaut (2009) discovered that the type of virtual body can influence the attitudes and behavior of participants, which they referred to as the Proteus Effect. For example, in their studies the attractiveness of the virtual body influenced proxemic approaches to others, and being taller led to greater confidence in negotiations, an effect that carried over to face-to-face real-world interaction with a confederate. Several studies have shown that the illusion of body ownership leads to changes in attitudes and behaviors. For example, adults embodying a child body (Banakou, Groten, & Slater, 2013) perceived objects in the virtual world as larger compared to another group embodied in an adult shaped body but of the same height as the child. Those embodied in the child body also identified more with child-like attributes compared with the adult embodied group. In another study participants embodied in a body looking like Albert Einstein exhibited enhanced cognitive performance compared to those in another virtual body representing their own age (Banakou, Kishore, & Slater, 2018).

In this paper first we discuss how embodiment has been shown to reduce implicit racial bias as a specific example of how embodiment can lead to implicit attitude changes. Then we propose a paradigm for the enhancement of helping behavior that we refer to as the Golden Rule Embodiment Paradigm, and provide two main examples of this. The negative form of the Golden Rule in ethics is: "What is hateful to you, do not do to your fellow", and the positive form is "Treat others as you would want them treat you". Singer (1963) has demonstrated that the positive and negative forms are

equivalent. (See also Recommended Readings). In this paper we treat the Golden Rule not as a principle for moral behavior but as a method for enhancing helping behavior towards victims of harm.

Implicit Racial Bias

Multiple studies have shown that embodying 'white' people in a 'black' virtual body will lead to a reduction in their implicit racial bias. This was shown in the context of the RHI by Maister, Sebanz, Knoblich, and Tsakiris (2013) where subjects had ownership over a black rubber hand. The racial implicit association test (IAT) (Greenwald, McGhee, & Schwartz, 1998) was used for measurement. The IAT samples how people associate between categories (in this case race) and their positive or negative valence. The greater the association between, say, the representation of a black person and positive valenced words the faster that subjects would be able to associate these two in a rapid response time test. Hence faster associations and fewer errors in matching black faces with negative words and white faces with positive words, compared to the opposite way around, indicates implicit bias. A between groups study carried out by Peck, Seinfeld, Aglioti, and Slater (2013) embodied white participants in a white, or black, or purple virtual body or no virtual body. It was found that there was a reduction in implicit bias only amongst those with the black virtual body. This was replicated by Banakou, Hanumanthu, and Slater (2016) who showed that the effect lasted for at least one week after the VR exposure, and also replicated in (Banakou et al., 2020). Hasler, Spanlang, and Slater (2017) exploited the Chameleon Effect (Chartrand & Bargh, 1999) which posits that people in rapport are likely to mimic one another's postures and gestures. They found that participants mimicked a virtual partner more if that partner had the same virtual skin color as their own virtual skin color.

A neural network model that reproduces the virtual embodiment results was proposed by Bedder et al. (2019). During the course of embodiment there is highly salient new information: 'I am or can be black'. The argument is that this will disrupt the prior associations, since when participants see a black face as the stimulus in the IAT test this is now more likely to be associated with the self, and thereby associated with positive attributes about the self.

In all the body ownership based studies the affective situation of the setting for the embodied experience has been either neutral or positive or controlled for. However, Groom, Bailenson, and Nass (2009) had participants imagining a job interview as part of their embodiment, a typically stressful experience and where racial bias is salient. In this case implicit racial bias increased, in contrast to all the other studies. To address this Banakou et al. (2020) found that although implicit racial bias decreased for participants in an affectively positive or neutral scenario, it actually increased for those in an affectively negative scenario in line with the finding of Groom et al. (2009). Changing the set of associations between representations of a group and valence involves implicit learning, and previous research has shown affective inhibition of cognitive learning – i.e., negative affect inhibits the learning of new associations (Storbeck & Clore, 2007).

Fostering prosocial attitudes and behavior

The Golden Rule paradigm relies on embodiment. The central idea is that the participant is first embodied as someone in a situation that causes harm to another. Even if they do not directly cause harm themselves, they are complicit, since they have the possibility to intervene to prevent this behavior by those directly causing it. Then the participant relives the same scenario, but now instead of being embodied as one of the aggressors, they are embodied as the victim. From this perspective they would not only have first-hand experience of the aggressive behavior but also witness their own previous complicity in the harmful behavior.

Our first example of this is concerned with sexual harassment of women by men. Neyret et al. (2020) embodied men in a VR bar scenario where they were amongst a group of 4 virtual men, who verbally harassed a lone woman. Participants then reexperienced the scenario either embodied as the woman, or as another one of the men. There was a control condition where participants were in the bar but nothing happened. One week later all participants took part in a virtual reprise of the Stanley Milgram obedience experiment, giving electric shocks to a virtual woman whenever she answered a question incorrectly in an apparent word-pair learning study. As the ‘voltage’ of the shocks increased the woman exhibited greater pain and demanded to be let out. Those who had been embodied as the

woman in the bar scenario the week before gave by far the least number of shocks before withdrawing, those as another man the most, and the control group was between these two. Body ownership over the virtual bodies was high across the conditions, as measured by a questionnaire derived from Botvinick and Cohen (1998).

Another study that used the same paradigm was concerned with aggression of police against a black suspect during an interrogation (Kishore et al., 2021). This was carried out with police officers in an inner city police department in the United States. In the scenario police officers embodied as white male officers were involved in an interrogation of a black male robbery suspect. The participants carried out the interview alongside a virtual officer who was racially abusive and threatened violence towards the suspect. There were two replay conditions. In one, participants reexperienced the same scenario again from the embodied viewpoint of the suspect, including witnessing whatever actions they had taken as an interrogator in the first round. A second group reexperienced the interview but through a window from outside the interview room, i.e., from a third person perspective. Approximately three weeks later, participants experienced a second scenario where they were in a virtual cafe talking with the same abusive officer. A male black customer entered the cafe and was immediately challenged by the abusive officer who accused him of wanting to steal the handbag of a white woman standing by the counter. The scenario ended with the abusive officer drawing his weapon. The response variable of interest was the extent to which the participant engaged in helping behavior towards the victim in the cafe, as measured by two independent coders, unaware of the conditions of the experiment. It was found that those who had previously been embodied as the suspect in the interrogation scenario exhibited greater helping behavior towards the victim than those who had seen the interview from outside the interview room.

Discussion

From these studies there are two essential features of the GREP to promote helping behavior or diminish antisocial behavior using VR. First, the participant is complicit in an action that causes harm to another. Second, later, the participant must reexperience that episode but from the embodied

viewpoint of the victim including being able to observe their own previous actions (or acquiescence) during the course of the harmful event. An overall schematic is shown in Figure 1, with illustrations from the two studies discussed above.

Being embodied as the victim serves two purposes. As we discussed earlier the type of virtual body influences attitudes and behaviors. Hence participants not only observe events from the viewpoint of the victim but may take on characteristics associated with the victim's body. Second, they witness the event from an alternative viewpoint. Self-distancing theory argues that reflecting on provocations from a third-person perspective can lead to the overcoming of aggressive thoughts and behaviors (Kross & Ayduk, 2017; Mischkowski, Kross, & Bushman, 2012). The advantage of VR is that one does not have to imagine the scenario but actually see and hear what happened from an embodied perspective The 'altruism borne of suffering' paradigm (Staub & Vollhardt, 2008) argues that although a minority of people who experience a traumatic event may develop aggressive behaviors or experience post-traumatic stress there is another group who transform their suffering into prosocial behavior. Participants embodied as the victim experience some psychological distress, albeit they know that it is not 'real' and it is not traumatic, but nevertheless altruism borne of suffering may have a useful role to play in understanding the mechanisms involved in the GREP. Finally, precisely because the experience of the victim is likely to arouse negative affect, future encounters with the same type of situation may lead participants to recall that negative affect, and therefore lead them towards avoidance of the behavior associated with negative feelings.

Finally we mention that VR has been considered as an 'empathy machine'. The idea is that people are put into viewpoint of a member of a disadvantaged group and then subjected to the usual type of indignities that the group suffers. Bevan et al. (2019) analyzed 150 articles (2012-2018) on this theme. The expectation is that this will increase empathy towards the group. Apart from political objections - Nakamura (2020) refers to this as 'toxic empathy' where more privileged people can purport to have experienced what life is like for the oppressed – there are problematic aspects of the concept of empathy in itself. Bloom (2017) reviewed a number of studies where empathy does not actually lead to changed or prosocial behavior, and instead he

argues for rational compassion. The GREP is not an example of VR as an empathy machine. In the empathy machine paradigm the participant is a passive receiver of harm from others. In the GREP participants are involved in or acquiescent in harm towards others, and then reexperience this from an embodied victim viewpoint, including seeing and potentially understanding the consequences of their own actions or non-actions. We consider that this double experience is vital in leading to behavioral change.

Conclusions

We have briefly reviewed results on how virtual embodiment influences attitudes and behavior as a function of the type of body, and in particular concentrated on how it may reduce implicit racial bias, a result that has been replicated many times. We have put forward a paradigm for enhancement of helping behavior towards victims of harm through double exposure to a scenario: first complicit in the harmful action, and second on the receiving end as the victim. Our hypothesis is that the double exposure causes non-additive effects above and beyond each individual exposure, much as seeing with two displaced eyes results in binocular vision. There are many unanswered questions – not least is the necessity for further studies to test the prediction that actual behavior would change, not only in VR but it in reality. Also, although the results obtained have been with a single VR exposure depicting a single incident, it would be important to know whether changes in behavior are persistent or whether multiple different exposures would be necessary. Although we have suggested some possible underlying mechanisms such as self-distancing theory, these need to be rigorously addressed in the formulation of new hypotheses that follow from the underlying theory. Hence we put forward the GREP as a new area in the search for effective methodologies to reduce harmful behavior.

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References

Banakou, D., Beacco, A., Neyret, S., Blasco-Olivera, M., Seinfeld, S., & Slater, M. (2020). Virtual body ownership and its consequences for implicit racial bias are dependent on social context. *Royal Society Open Science, 7: 201848*. doi:https://doi.org/10.1098/rsos.201848

Banakou, D., Groten, R., & Slater, M. (2013). Illusory ownership of a virtual child body causes overestimation of object sizes and implicit attitude changes. *PNAS, 110*, 12846-12851. doi:10.1073/pnas.1306779110

Banakou, D., Hanumanthu, P. D., & Slater, M. (2016). Virtual Embodiment of White People in a Black Virtual Body Leads to a Sustained Reduction in their Implicit Racial Bias. *Frontiers in Human Neuroscience, 10:601*. doi:10.3389/fnhum.2016.00601

Banakou, D., Kishore, S., & Slater, M. (2018). Virtually Being Einstein Results in an Improvement in Cognitive Task Performance and a Decrease in Age Bias. *Frontiers in Psychology, 9*(917). doi:10.3389/fpsyg.2018.00917

Banakou, D., & Slater, M. (2014). Body Ownership Causes Illusory Self-Attribution of Speaking and Influences Subsequent Real Speaking. *PNAS, 111*(49), 17678-17683. doi:doi.org/10.1073/pnas.1414936111

Bedder, R. L., Bush, D., Banakou, D., Peck, T., Slater, M., & Burgess, N. (2019). A mechanistic account of bodily resonance and implicit bias. *Cognition, 184*, 1-10. doi:https://doi.org/10.1016/j.cognition.2018.11.010

Bevan, C., Green, D. P., Farmer, H., Rose, M., Cater, K., Stanton Fraser, D., et al. (2019). *Behind the Curtain of the" Ultimate Empathy Machine": On the Composition of Virtual Reality Nonfiction Experiences.* Paper presented at the Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems.

Blanke, O., Slater, M., & Serino, A. (2015). Behavioral, Neural, and Computational Principles of Bodily Self-Consciousness. *Neuron, 88*(1), 145-166.

Blascovich, J., Loomis, J., Beall, A. C., Swinth, K., Hoyt, C., & Bailenson, J. N. (2002). Immersive Virtual Environment Technology as a methodological tool for Social Psychology. *Psychology Inquiry, 13*, 103-124. doi:10.1207/S15327965PLI1302_01

Bloom, P. (2017). *Against empathy: The case for rational compassion*: Random House.

Botvinick, M., & Cohen, J. (1998). Rubber hands 'feel' touch that eyes see. *Nature, 391*(6669), 756-756. doi:10.1038/35784

Chartrand, T. L., & Bargh, J. A. (1999). The Chameleon effect: The perception-behavior link and social interaction. *Journal of Personality and Social Psychology, 76*, 893-910.

De Vignemont, F. (2011). Embodiment, ownership and disownership. *Consciousness and Cognition, 20*(1), 82-93.

Gallagher, S. (2000). Philosophical conceptions of the self: Implications for cognitive science. *Trends in Cogn. Sci, 4*, 14-21.

Gonzalez-Franco, M., Slater, M., Birney, M., Swapp, D., Haslam, S. A., & Reicher, S. D. (2018). Participant concerns for the Learner in a Virtual Reality Replication of a Milgram Obedience Study. *PLOS ONE, 13(12): e0209704.* . doi:doi.org/10.1371/journal.pone.0209704

Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. K. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology, 74*, 1464.

Groom, V., Bailenson, J. N., & Nass, C. (2009). The influence of racial embodiment on racial bias in immersive virtual environments. *Social Influence, 4*, 231-248.

Hasler, B., Spanlang, B., & Slater, M. (2017). Virtual Race Transformation Reverses Racial In-group Bias. *PLOS ONE, 12*(4), e0174965. . doi:https://doi.org/10.1371/journal.pone.0174965

Kishore, S., Spanlang, B., Iruretagoyena, G., Halan, S., Szostak, D., & Slater, M. (2021). A Virtual Reality Embodiment Technique to Enhance Helping Behavior of Police Towards a Victim of Police Racial Aggression. *PRESENCE: Virtual and Augmented Reality*, 1-51.

Kross, E., & Ayduk, O. (2017). Self-Distancing: Theory, Research, and Current Directions *Advances in Experimental Social Psychology* (Vol. 55, pp. 81-136): Elsevier.

Maister, L., Sebanz, N., Knoblich, G., & Tsakiris, M. (2013). Experiencing ownership over a dark-skinned body reduces implicit racial bias. *Cognition, 128*, 170-178. doi:10.1016/j.cognition.2013.04.002

Mischkowski, D., Kross, E., & Bushman, B. J. (2012). Flies on the wall are less aggressive: Self-distancing "in the heat of the moment" reduces aggressive thoughts, angry feelings and aggressive behavior. *Journal of Experimental Social Psychology, 48*(5), 1187-1191.

Nakamura, L. (2020). Feeling good about feeling bad: virtuous virtual reality and the automation of racial empathy. *Journal of Visual Culture, 19*(1), 47-64.

Neyret, S., Navarro, X., Beacco, A., Oliva, R., Bourdin, P., Valenzuela, J., et al. (2020). An Embodied Perspective as a Victim of Sexual Harassment in Virtual Reality Reduces Action Conformity in a Later Milgram Obedience Scenario. *Scientific Reports, 10*(1), 6207. doi:10.1038/s41598-020-62932-w

Pan, X., & Hamilton, A. F. d. C. (2018). Why and how to use virtual reality to study human social interaction: The challenges of exploring a new research landscape. *British Journal of Psychology, 109*, 395-417. doi:10.1111/bjop.12290

Peck, T. C., Seinfeld, S., Aglioti, S. M., & Slater, M. (2013). Putting yourself in the skin of a black avatar reduces implicit racial bias. *Consciousness and Cognition, 22*, 779-787. doi:10.1016/j.concog.2013.04.016

Petkova, V. I., & Ehrsson, H. H. (2008). If I Were You : Perceptual Illusion of Body Swapping. *PLOS ONE, 3*, e3832. doi:10.1371/journal.pone.0003832

Sanchez-Vives, M. V., & Slater, M. (2005). From Presence to Consciousness Through Virtual Reality. *Nature Reviews Neuroscience, 6*, 332-339.

Singer, M. G. (1963). The golden rule. *Philosophy, 38*(146), 293-314.

Slater, M., & Sanchez-Vives, M. V. (2016). Enhancing Our Lives with Immersive Virtual Reality. *Frontiers in Robotics and AI, 3:74*. doi:10.3389/frobt.2016.00074

Slater, M., Spanlang, B., Sanchez-Vives, M. V., & Blanke, O. (2010). First person experience of body transfer in virtual reality. *PLOS ONE, 5*(5), e10564-e10564. doi:10.1371/journal.pone.0010564

Staub, E., & Vollhardt, J. (2008). Altruism born of suffering: The roots of caring and helping after victimization and other trauma. *American Journal of Orthopsychiatry, 78*(3), 267-280.

Storbeck, J., & Clore, G. L. (2007). On the interdependence of cognition and emotion. *Cognition and Emotion, 21*(6), 1212-1237.

Sutherland, I. E. (1965). The Ultimate Display. *Proceedings of the IFIP Congress, 2*, 506-508.

Yee, N., Bailenson, J. N., & Ducheneaut, N. (2009). The Proteus effect: Implications of transformed digital self-representation on online and offline behavior. *Communication Research, 36*(2), 285-312. doi:https://doi.org/10.1177/0093650208330254

Recommended Readings

Bailenson, J. (2018). Experience on demand: What virtual reality is, how it works, and what it can do: WW Norton & Company.
This book provides an informal guide to virtual reality and reviews its applications and experimental studies over the past few decades, including a discussion of recommendations as to the best types of use cases for the technology.

Lanier, J. (2017). Dawn of the new everything: A journey through virtual reality: Bodley Head.
The author originally coined the term 'virtual reality' and was instrumental in making virtual reality become widely known in the late 1980s and 1990s. This is an insider's view of the rise of virtual reality from a historical and personal perspective.

Maister, L., Slater, M., Sanchez-Vives, M. V., & Tsakiris, M. (2015). Changing bodies changes minds: owning another body affects social cognition. Trends in cognitive sciences, 19(1), 6-12. doi:doi:10.1016/j.tics.2014.11.001. This reviews research on the rubber hand illusion and virtual reality based approaches to reduction of implicit racial bias.

Reinikainen, J. (2005). The golden rule and the requirement of universalizability. The Journal of Value Inquiry, 39(2), 155-168. doi: doi.org/10.1007/s10790-006-8363-y
This an in-depth review of the Golden Rule and in particular discusses and resolves the problem that if you would wish others to harm you then the rule would apparently allow you to harm others.

Skarbez, R., Brooks Jr, F. P., & Whitton, M. C. (2018). A survey of presence and related concepts. ACM Computing Surveys (CSUR), 50(6), 96. doi: doi.org/10.1145/3134301
Presence is the illusion of 'being there' in a virtual reality, and this paper surveys the concept.

Notes

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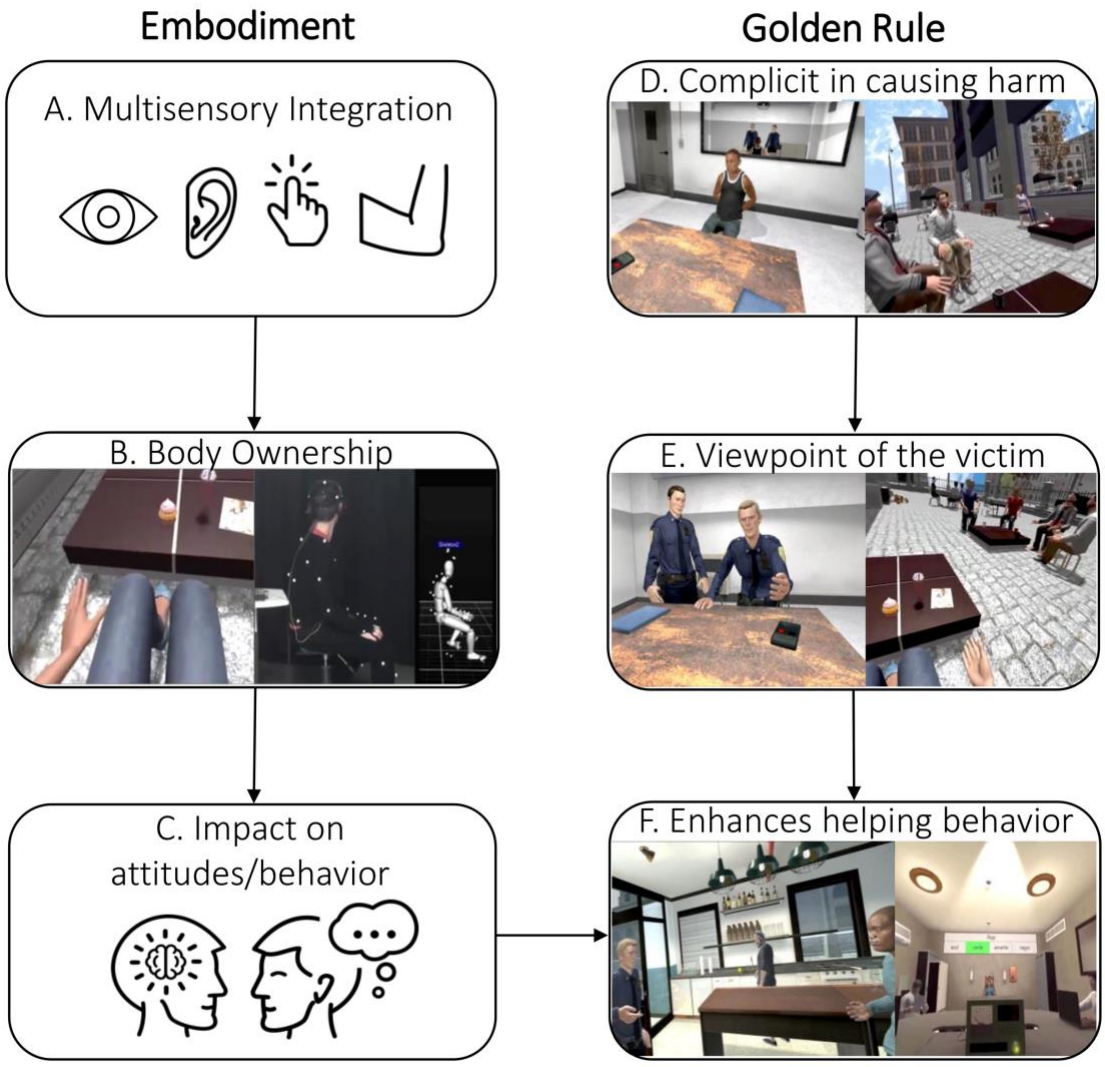

Figure 1 – A schematic of the Golden Rule Embodiment Paradigm. (A) Embodiment produces integrated multisensory signals that provide evidence about the body. (B) Embodiment may lead to altered body ownership. The left image shows the view of a participant who is looking down and seeing their life-sized virtual legs substituting their real legs. The right shows a person in a body tracking suit which sends data about their movements to the computer program, which then maps these onto virtual body movements. (C) Different body types may influence attitudes and behavior, such as impacting implicit racial bias. (D) In the first phase of the GREP participants are complicit in the causing of harm to another. The left image shows a view of suspect under interrogation from the viewpoint of an embodied police officer – the reflection of the two officers can be seen in the mirror. The right hand image shows the sexual harassment scenario where the participant is seated amongst a group of men, and nearby there is a lone woman who is harassed by some of the men. (E) In the second phase participants reexperience the scenario from the embodied perspective of the victim. The left image shows the interrogation from the viewpoint of the suspect. The right image shows the view of the men from the perspective of the woman. (F) The combination of body ownership and the GREP leads to enhanced helping behavior towards the victim in a later scenario. The left image shows the police officer confronting a black customer in the cafe scene, and the right image the setup of the virtual obedience study where the participant gives electric shocks to the virtual woman seated at the far end.