22 Virtual Reality and Prosocial Behavior

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Introduction

People have long been intrigued by the notion of a virtual space that could offer an escape from reality to new sensory experiences. As early as 1965, Sutherland envisioned that the 'ultimate display' would enable users to actively interact with the virtual space as if it were real, giving them "a chance to gain familiarity with concepts not realizable in the physical world" (Sutherland, 1965, p. 506). William Gibson appears to have shared this vision when coining the term 'cyberspace' in his 1984 novel *Neuromancer*, defining it as "a consensual hallucination experienced daily by billions of legitimate operators, in every nation, by children being taught mathematical concepts · · · " (p. 51). While the image may have seemed farfetched at the time, the mounting popularity of home video game consoles, massively multiplayer online role playing games (MMORPGs), and massive open online courses (MOOCs) all demonstrate that virtual reality (VR) is an increasingly integral component of our everyday lives.

Despite some romanticized versions of VR, much of the previous literature focused on its dangers. Early studies voiced concerns about how individuals would no longer be able to receive true emotional and social support online (e.g., Kraut et al., 1998) and more recent research focused on Internet addiction (e.g., Lam et al., 2009) as well as the antisocial effects of playing violent games (e.g., Bartholow, Bushman, & Sestir, 2006). Overall, the results suggest that spending extensive amounts of time in VR can result in apathetic or even violent attitudes and behavior toward others. Indeed, early conversations between Jaron Lanier, one of the pioneers of the technology, and William Gibson, who consulted Lanier while writing his manifesto, focused on this tension. Lanier envisioned prosocial uses for the technology he championed, but Gibson felt compelled to write about the less wholesome applications, saying, "Jaron, I tried. But it's coming out dark" (Lanier, 2013, p. 329).

In terms of academic research, there is a group of scholars who focus on a more positive outlook; the unique affordances of virtual environments actually promote prosocial behavior when leveraged. Recent developments show that even brief virtual interventions can increase environmental awareness, reduce racial bias, and enhance general altruistic behavior. These interventions have been found to be especially powerful when the user feels fully immersed in the virtual world. With these findings in mind, the present chapter will outline the characteristics and strengths of virtual environments. It will then describe the malleable nature of prosocial behavior and explain how the

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technological affordances of virtual environments can be properly employed to encourage prosocial behaviors.

Using Virtual Environments for Social Science Research

Virtual experiences provide users with the chance to experience realistic environments without the need to be physically present and can be applied to a multitude of domains such as education, business, and entertainment. Because immersive virtual environments (IVEs) – virtual environments that perceptually surround the user (Lanier, 2001; Loomis, Blascovich, & Beall, 1999) – provide the opportunity to create realistic situations in a controlled manner, they can be employed as a useful methodology to study human psychology and behavior. IVEs allow researchers to address three main issues in social science research: (1) the experimental control-mundane realism tradeoff, which addresses the challenge of conducting a controlled experiment that presents realistic situations to participants, (2) difficulties in replicating studies, and (3) the use of non-representative samples (Blascovich et al., 2002). By using IVEs, participants are able to directly experience realistic and multisensory scenarios in a controlled environment, which enhances the validity and the reliability of the study. For example, users can be immersed in a virtual forest, where the movement of animals and other environmental minutiae can be controlled. With IVEs, researchers are presented with a novel perspective and capacity to study social interactions, which allow new insight into human behavior. Further, because technological advances allow for changes in the nature of interactions in VR (i.e., transformed social interaction; Bailenson et al., 2004), IVEs can be used to explore research questions that cannot be pursued under the constraints of physical reality.

What is Transformed Social Interaction?

People appear to have an inherent desire to alter their appearances. Individuals consult self-help books for exercise regimens, go on diets, and in the extreme case, undergo plastic surgery for self-enhancement. However, the extent to which one can change is highly limited in the physical world. Relatively extreme changes, such as plastic surgery, are not only dangerous, but also difficult to reverse. VR offers us a venue to go beyond these physical limitations. Within VR, people are able to bend the law of physics and change their appearance, abilities, and surroundings.

In contrast to early assertions that computer-mediated communication (CMC) was inherently inferior to face-to-face communication, Walther (1996) argued that CMC could be even more intimate and salient than face-to-face communication (hyperpersonal model of communication). Perhaps because the model was conceptualized when text-based CMC was the norm, Walther focused on the user's increased ability to monitor his or her verbal messages to support this argument. However, by taking technological advances into account, studies show that the hyperpersonal model can be extended

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to nonverbal elements (Bailenson et al., 2005). The technology of immersive virtual environments allows "changing the nature of social interaction" (Bailenson et al., 2004, p. 429) through the enhancement or degradation of interpersonal communication. Users can decouple their actual behavior and form from their virtual representations, resulting in behavioral and social implications for both the virtual and physical world. This research paradigm is known as transformed social interaction (TSI). Bailenson and his colleagues (2004) outline three main dimensions of TSI: (1) self-representation, (2) sensory capabilities, and (3) situational context. More specifically, by using computer algorithms, it is possible to (1) transform the visual representation of the interactants by changing their appearance or nonverbal behavior (e.g, increasing mutual eye gaze with the interactant), (2) heighten sensory capabilities by displaying signals that are available in face-to-face (FTF) contexts (e.g., displaying the names of one's interactants in virtual bubbles above their heads) or reduce sensory capabilities by hiding signals that are available in FTF contexts (e.g., choosing not to render distracting hand motions), and (3) alter the temporal or spatial context by adjusting the speed of the interaction or the proximity/position of the components of the virtual environment. The remainder of this section will examine these three categories in further detail.

Altering Avatar Appearance and Behavior

Studies have documented that digitally altering others' nonverbal behavior, such as eye gaze and mimicry, has a significant influence on one's perception of and attitude toward them (e.g., Bailenson & Yee, 2005; Garau et al., 2003). For example, Bailenson and Yee (2005) found that people liked a computerized agent better when it mimicked their behavior compared to when it mimicked the prior participant, even though the participants were fully aware that the agent was not controlled by a real person.

In addition to transforming nonverbal behavior, new techniques also allow users to alter their digital self-representations, which can subsequently change the manner in which they perceive themselves (Yee & Bailenson, 2007). Dubbed the 'Proteus effect,' this well-researched phenomenon shows that "an individual's behavior conforms to their digital self-representation independent of how others perceive them" (Yee & Bailenson, 2007, p. 271). Specifically, Yee and Bailenson (2007) found that participants who embodied attractive avatars exhibited more confidence and openness within social interactions compared to those who embodied unattractive avatars, despite the fact that the avatars were randomly assigned. Similarly, participants who embodied short avatars were less confident and more likely to behave submissively in a negotiation for money compared to their tall-avatar counterparts. The perceptual effects of embodying various virtual representations can last well after the immersive experience. When adults embodied a child in virtual reality, they were more likely to identify themselves with child-like characteristics afterwards. In comparison, those who embodied an adult body scaled to the size of a child still identified with adult traits (Banakou, Groten, & Slater, 2013).

The possibility of identifying an alien body as one's own, also known as 'body transfer,' has been documented outside of VR using the 'rubber hand' illusion, where

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participants feel gentle strokes on their own hand when a detached rubber hand is being synchronously touched (Botvinick & Cohen, 1998). More germane to the current context, Slater et al. (2010) found that male participants identified with a female virtual body when they embodied the avatar of a young girl, which led them to react physiologically to perceived threats toward the girl in the virtual environment (Slater et al., 2010). Specifically, male participants who had been given a first (versus third) person perspective of the female avatar exhibited greater heart rate deceleration when they later saw the same avatar being slapped by another female avatar, indicating identification with the avatar, in spite of physical dissimilarities (Slater et al., 2010).

Transforming Sensory Capabilities

The critically acclaimed television series *Lie to Me* features a leading psychologist (inspired by Paul Ekman) who interprets fleeting micro-expressions and body language to detect whether someone is telling the truth or lying. The notion of accurately monitoring others' nonverbal behavior to 'read' their thoughts is extremely attractive when considering the fact that a substantial amount of communication consists of nonverbal, rather than verbal communication (Birdwhistell, 1970; Mehrabian, 1981). In reality, however, it is very difficult to track others' nonverbal cues, especially in real time. Human senses typically are not capable of detecting and consciously processing millisecond-by-millisecond changes. It is also challenging for people to monitor their own nonverbal behavior, as most of it takes place subconsciously.

The technology of IVEs offers a novel method to process nonverbal cues by enhancing our sensory capabilities. The computer can track the information of interest and display the data to the user. For example, an instructor can monitor the eye gaze of his or her students to properly gauge their involvement in the lesson. Interactants can place their basic information (e.g., name, employer, hometown, etc.) in floating bubbles above their heads to reduce uncertainty and facilitate the communication (Bailenson et al., 2004). It is also possible to grant communicators the sensory capability to hear each other's heartbeats (Janssen et al., 2010) or see a summary of each other's facial expressions or arousal levels during a conversation.

Modifying the Contextual Situation

Imagine a world that is no longer governed by spatial and temporal rules. You do not have to compete for a front row seat. You can decide which direction your interactants should face. You can replay a conversation to make sure that you understood all of the details correctly and 'forward' the part where your friend suddenly decided to talk about her pet lizard for 20 minutes. The final category of TSI, transformation of the contextual situation, pertains to the capacity of VR to make such a world possible.

By using computer algorithms, interactants can easily bend the spatial and temporal rules to make the virtual environment match their needs and preferences. For example, every student can have a front row seat in a virtual classroom, an attractive option that is not viable in physical classrooms (Bailenson et al., 2008). Recent studies suggest

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that you can even modify the general ambience of the same environment, which can subsequently influence your mood. Riva and his colleagues (2007) entertained this possibility by creating 'anxious' and 'relaxing' versions of the same virtual park through manipulations of its auditory (e.g., sound, music) and visual (e.g., shadows, texture) features.

The diverse range of work on TSI demonstrates that the technology of virtual reality can be employed to modify social interactions in significant ways, producing attitudinal and behavioral changes that extend to the physical world (Ahn, Le, & Bailenson, 2013). This powerful capacity that enables alterations of self-representation, sensory capabilities, and situational context provides the foundation to use virtual experiences as a tool to both promote and accurately assess prosocial intentions and behavior.

The Plasticity of Prosocial Behavior

While it is common to explain prosocial behavior in terms of individual predispositions such as trait empathy or altruistic personality, prosocial behavior can be encouraged by seemingly simple interventions (e.g., Galinsky & Ku, 2004; Weng et al., 2013). Writing a short essay about the typical day of an older man from his perspective significantly reduced prejudice toward the elderly (Galinsky & Ku, 2004) and receiving audio-based compassion training for 30 minutes per day significantly increased altruistic tendencies after only two weeks (Weng et al., 2013).

This suggests that prosocial behavior is highly malleable. Studies show that egocentric motives, priming, and mood valence all influence an individual's willingness to engage in altruistic actions.

Using Egocentrism for Prosocial Behavior

Individuals have the intrinsic motivation to protect their sense of 'self.' While some may believe that individuals must abandon their selfish motives in order to engage in prosocial behavior, studies show precisely the opposite; properly leveraging egocentric motives can actually promote prosocial actions. For instance, members of the dominant group (Caucasians) were more likely to support affirmative action when they were told it would not pose a threat to their ingroup; in contrast, the likeliness of supporting affirmative action was not influenced by how it was perceived to benefit minorities (Lowery et al., 2006). Similarly, studies argue that the perceived overlap between the self and the other and the relevance of the issue to the self are egocentric factors that can be used to encourage prosocial behavior.

Some scholars argue that perspective taking promotes prosocial behavior through self-referential neural processing, which enables people to empathize with a foreign situation. That is, perspective taking may lead to the "blurring of the distinction between self and other" (Ames et al., 2008, p. 643), which triggers empathic concerns. Perspective taking, therefore, involves an egocentric process; people show more positive behavior and attitudes toward the target because of an increase in perceived self–other

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overlap (Galinsky & Moskowitz, 2000). The benefits of perspective taking typically extend beyond a specific individual to members of his or her group. For example, Galinsky and Moskowitz (2000) found that taking the perspective of a stereotyped group member (experiments 1 and 2) was effective in reducing stereotype expression and stereotype accessibility of the elderly and African Americans.

The degree of psychological attachment to a given issue or person is another egocentric element that affects prosocial behavior; the individual's desire to promote self-relevant issues drives altruistic behavior. O'Reilly and Chatman (1986) argue that three main factors predict the psychological attachment of an individual to a given situation: compliance, identification of relevance, and internalization (the degree of involvement of the individual). Identifying topic resonance and internalizing involvement are positively correlated with participants' prosocial action on an issue. The more attached people are to an issue, the more likely they are to act on it (O'Reilly & Chatman, 1986).

Priming Good, Priming Bad

Priming has also been fruitful in encouraging prosocial behavior. In their 2005 study, Nelson and Norton found that participants were more likely to engage in helping behavior when they were primed with a superhero (i.e., they gave a description of the traits of Superman) compared to those who were not primed at all (i.e., they gave a description of a dorm room). More important, those who were primed with a superhero were more likely to engage in actual volunteering behavior up to three months after the initial prime. Similarly, Greitemeyer (2009: experiment 1) found that participants were more likely to access prosocial thoughts after listening to songs with prosocial lyrics (e.g., "Love Generation" by Bob Sinclair) compared to songs with neutral lyrics (e.g., "Rock This Party" by Bob Sinclair).

In contrast, priming individuals with violent content can discourage prosocial behavior. Previous work found that children exposed to aggressive programs over time showed less obedience to rules (Friedrich & Stein, 1973). Anderson and Dill (2000) argue that exposure to violent content increases the accessibility of aggressive thoughts, leading to antisocial behavior. In their meta-analytic review, Anderson and Bushman (2001) conclude that experimental and nonexperimental studies support the argument that violent video games lead to increased aggression in children and young adults. Considering the pervasiveness of violence in everyday media, these results have implications for content regulation, especially for children and teenagers still undergoing cognitive development.

Mood: Feel Good–Do Good

People are more likely to help others when they are in a good mood. Research consistently shows that positive moods lead to increased altruistic behavior through various mechanisms, including positive social outlook and desire for mood maintenance (Carlson, Charlin, & Miller, 1988). Similarly, Whitaker and Bushman (2012) found that

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playing relaxing video games led to a more positive mood, compared to playing a neutral or violent game, which subsequently led to more helpful behavior.

Physical Limitations in Previous Work

While previous research has been successful in demonstrating the malleability of prosocial behavior, there are some limitations to conducting prosocial research in the physical world. Most notably, it is extremely challenging to attain both experimental control and everyday realism (Blascovich et al., 2002). Studies on bystanders' responses to violent situations demonstrate this tension; experimental methods require "abstractions from the complexities of real life" (Rovira et al., 2009, p. 2), while field studies inevitably include multiple confounds (Rovira et al., 2009), reducing their power to provide concrete results. In addition, the ease with which individuals construct vivid mental simulations varies greatly, which poses difficulties for perspective taking and other vignette-based studies. Because virtual reality can overcome the constraints of face-to-face communication and allow TSI in a controlled yet realistic manner, these issues can be at least partially addressed by utilizing virtual environments.

Virtual Reality and Prosocial Behavior

Many aspects of virtual environments render them ideal for conducting studies on prosocial behavior. Immersive worlds provide a mix of realism and control, and also offer new methods by which to study nonverbal behavior (e.g., measuring eye gaze, interpersonal distance, etc.). By unobtrusively observing participants' interactions with virtual humans, research can determine factors that increase compassion and empathy toward others (Rovira et al., 2009). Further, the measurement of physiological responses and subtle nonverbal responses can supplement traditional self-report measures, providing valuable insight into prosocial behavior. Gillath et al. (2008) found that individuals' dispositional levels of compassion predicted their proxemic behavior (e.g., movement paths, head orientation, interpersonal distance) when they were exposed to a visually impaired man asking for help, demonstrating that virtual environments can be used to measure prosocial responses in an unobtrusive manner. The plausibility of virtual environments may also elicit more realistic responses from participants than an overly artificial experiment in the physical world (Rovira et al., 2009). Previous studies indicate that virtual experiences can produce measurable positive behavior.

For example, when placed in an immersive virtual environment, participants were more likely to help the victim of violence when he looked toward the participant for help, although this was only the case for ingroup victims (Slater et al., 2013). Similarly, Navarrete et al. (2012) explored a virtual representation of the "trolley problem" – a decision that involved saving one life at the cost of others. When faced with this decision in virtual reality, participants experienced high levels of arousal, allowing researchers to investigate the link between moral judgment and prosocial action. These discoveries

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would have been difficult without the realism and detailed tracking measures available in virtual environments.

Prosocial Health and Medical Applications

As virtual experiences yield perceptual changes through alterations in self-representation and their surrounding environments, they can be used to positively influence health-related behaviors and medical conditions. For example, participants who viewed self-resembling avatars losing weight based on their level of exercise in virtual environments were more likely to display healthy behaviors than those who viewed avatars that did not resemble the participant (Fox & Bailenson, 2009).

There are many potential applications of VR as a tool for positive change in the medical field; the therapeutic possibilities of treating patients with eating disorders in virtual environments to promote positive body image (Perpiñá et al., 1999) in addition to the potential of virtual reality to treat post-traumatic stress disorder using exposure therapy (Rizzo et al., 2009), to improve the driving performance of military personnel recovering from traumatic brain injury (Cox et al., 2010), and to alleviate the pain of adolescent burn patients (Hoffman et al., 2000) have been explored.

Virtual interventions are also one of the few effective treatments for youth with high-functioning autism. Jarrold and his colleagues (2013) demonstrated that virtual environments could be used for a more nuanced understanding of children with higher functioning autism spectrum disorder and could thus inform efforts to design proper interventions. In one such attempt, participants were placed in several social situations in virtual reality, using an avatar customized to look like themselves. Over a five-week period, participants who received this treatment showed improvement in social function and cognition (Kandalaft et al., 2013). In another study, researchers presented autistic adolescents with a graphical display that quantified their emotion levels ('emotion bubbles') during a conversation with their peers. The study found that this enhanced sensory capacity helped the participants understand and adjust their facial expressions (Madsen et al., 2008). These results present a promising future for the use of IVEs in medical treatment and therapy across a variety of conditions.

Prosocial Attitude and Behavior Change

Virtual experiences can also impact attitudes, generating prosocial behavior. Positive effects have been found in reducing prejudice and increasing general altruistic behavior. For example, Ahn and her colleagues (2013) examined the effect of embodied experiences on helping behavior by randomly assigning participants to either a colorblind or normal condition in an IVE. In the normal condition, participants were asked to imagine they had red-green colorblindness. After the study, participants were offered the chance to assist colorblind people. Those who had embodied the colorblind condition were more likely to volunteer to help than those who had imagined being colorblind, underscoring how virtual embodiment can be a more effective method than mental simulation for perspective taking.

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However, the implications of embodying the avatar of an outgroup member are not always so clear-cut. In their study, Groom, Bailenson, and Nass (2009) had participants either embody or imagine themselves as a black or white model in a virtual environment. Instead of showing a reduction in prejudice, those who embodied black avatars displayed stronger implicit racial bias in the physical world, suggesting increased stereotype activation. This difference was not found for the mental simulation condition.

In contrast to Groom and her colleagues (2009), a more recent study found that participants who embodied dark skinned avatars exhibited decreased implicit racial bias compared to those who embodied light or purple-skinned avatars (Peck et al., 2013). Even when the implicit association test (IAT) was given to participants three days later, those who had embodied dark skinned avatars still showed significantly less racial bias (Peck et al., 2013). These disparate results suggest that the effects of embodiment on prejudice are sensitive to certain boundary conditions, which can lead to different results. Peck and colleagues used a more advanced system to track and render avatar movements; this increased immersion could explain why empathy trumped priming in their study.

In addition to attitudinal changes, virtual experiences also lead to behavioral changes in the physical world. For example, participants who were granted the "superpower" of flight in virtual reality were more likely to display altruistic behavior in the physical world (helping the researcher pick up a spilled cup of pens) than those who rode as a passenger in a virtual helicopter (Rosenberg, Baughman, & Bailenson, 2013).

Prosocial Environmental Behavior

Immersion in virtual environments impacts and promotes prosocial environmental behavior. In one series of studies, participants were asked to either cut down a virtual tree (IVE condition) or imagine a tree being cut down (mental simulation condition). While participants in both conditions showed an increase in pro-environmental self-efficacy (i.e., the belief that their actions could improve the environment), the participants in the embodiment condition were more likely to engage in pro-environmental behavior in physical reality (paper conservation) than those in the mental simulation condition, suggesting that embodied experiences are crucial to behavior change (Ahn, Bailenson, & Park, 2013).

Similarly, a virtual simulation of flooding evoked greater awareness and knowledge of coping strategies for natural disasters than traditional images of flooded areas (Zaalberg & Midden, 2010). This presents the potential application of IVE for future disaster preparedness. With more knowledge and awareness of what the event may feel like, people may respond to victims more quickly, enabling more efficient disaster management. Presence, or the degree to which users actually feel they are in the environment, is an important consideration in response; the vividness and intensity of the virtual experience are both factors in promoting attitude change (Meijnders, Midden, & McCalley, 2006).

Virtual nature can also induce anxiety or relaxation among users (Riva et al., 2007; Valtchanov, Barton, & Ellard, 2010). The degree of immersion can impact these effects:

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participants who saw a restorative environment (nature scenes) on a high immersive screen were more likely to show stress-reduction than those who saw the environment on a low immersive screen. Immersion was manipulated by the size of the screen (De Kort et al., 2006). These results indicate the potential of virtual environments to be used as a tool for social action in the environmental sphere. If higher levels of emotion can be induced through high immersion, virtual environments that vividly depict the potential devastating outcomes of global warming may produce attitude and behavior change.

Conclusion

Previous literature has explored the potential of using virtual experiences to promote prosocial behavior and attitude changes. Promising results have been found for prejudice reduction, general altruistic behavior, positive health behaviors and medical treatment, and knowledge and preparation for natural disasters. Future research should explore different forms of embodiment; for example, animal embodiment may produce significant effects on prosocial behavior. Experiment length is another consideration, as greater time spent immersed may result in more pronounced effects. Social bias presents another potential area for study in virtual spaces; embodying the ill or physically impaired may alter attitudes and behaviors to such groups in the physical world. Further research should also consider how TSI can be used to leverage psychological factors that affect prosocial motivations, such as egocentrism, priming, and mood. From our review, we conclude that virtual spaces provide new ways to change attitudes and promote prosocial behavior, and that more work is required to determine the extent of these transformative effects.

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