

Doppelgängers – a new form of self?

Jeremy N. Bailenson on the psychological consequences of seeing the 'self' acting independently

Humans have long been able to see their reflections in mirrors and other reflective surfaces. Since the past century, film and video technology has provided a way to view the self 'asynchronously', such that the video image shows a behaviour that the human actually performed but at a previous time. New technology that creates 'avatars', virtual models that look just like the self, allow for a wholly new human experience – seeing the 'self' perform an action that was never actually performed physically by the viewers. Can these 'doppelgängers' – virtual representations that may look like a person but act independently – cause psychological consequences in the physical world?

questions

Given how much information you share while social networking how easy would it be for someone to produce a doppelgänger of you?

resources

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Orville Redenbacher was a noted popcorn mogul, and one of the most successful brand icons in US history. He would frequently be seen in television commercials advertising his product, proclaiming that 'You'll taste the difference or my name isn't Orville Redenbacher'. Redenbacher passed away in 1995, but there was enough video and photographic material from decades of his public life to build a 3D model of his head and body, and to use sound clips to create a persuasive analog of his voice. Consequently, in a surprising move, in 2006, the owner of the brand, ConAgra, released a commercial with a virtual Orville Redenbacher dancing around while listening to an MP3 player, popping popcorn and exclaiming, 'Can you believe this little baby holds thirty gigs?'

Today, however, this technology is porting from expensive film studios into the living room. Video game technology allows users to build doppelgängers that look like them, but once built are controlled by the video game animations. For example, the Microsoft Kinect has many features that allow avatars to resemble the users, especially the 'Avatar Kinect', which allow people to have remote collaborations in which their avatars are co-present even though the people controlling those avatars are in separate physical locations. A number of recent experiments run by my colleagues and me at Stanford's Virtual Human Interaction Lab have explored the question of what happens when individuals are exposed to their autonomous doppelgängers. Does existing

psychological theory provide predictions regarding the experience of seeing oneself from the third person? In this article I focus on three different research areas: health communication, false memories, and marketing.

Health communication

People know that healthy behaviours are important. They are barraged by the media on a daily basis, reminding them, for example, to exercise, eat right, and get a good night's sleep. However, relatively few people actually make the effort to do so. Why not? Some researchers posit that it results from a failure of 'self-efficacy'. People simply do not believe that they have the ability to lose weight or get in shape. Might it be possible, by observing one's doppelgänger become the healthy person that one wants to be, to encourage and induce healthy behaviours? Jesse Fox, while a student at Stanford's Virtual Human Interaction Lab, ran a number of studies designed to answer that question (see Fox & Bailenson, 2010, for a review).

In one line of research (Fox & Bailenson, 2009), adults came to our lab, put on a head-mounted display that allowed them to be immersed perceptually in a virtual environment and watched their virtual doppelgängers exercise, someone else's doppelgänger exercise, or their own doppelgänger stand still. Participants in the self-exercise condition reported higher 'self-efficacy' – the belief that they could exercise successfully – than participants in the other two conditions. Simply by watching their doppelgängers exercise, participants expressed the intention to adopt that behaviour. More importantly, they claimed to have acted on their intentions: when we contacted all participants the next day, the exercise group reported that they had worked out for almost one hour more than participants in the two control conditions.

In a follow-up study, participants physically exercised, running in place while standing in the centre of a room in

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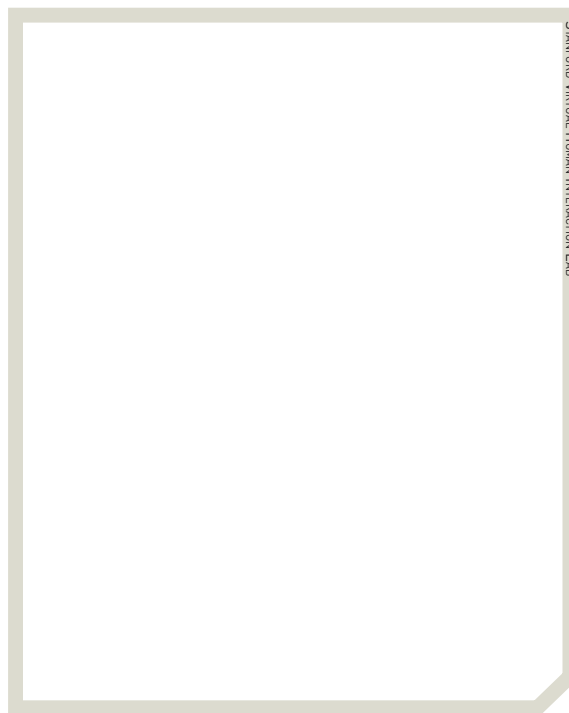
the lab, while wearing a head-mounted display and experiencing an immersive virtual environment with their doppelgänger in it. As they exercised, they watched their doppelgänger losing weight. For every minute they ran in place in the physical world, their doppelgänger became slimmer, that is, scaled down on the vertical axis. In other words, participants were able to connect the cause and effect of exercise and weight loss. Next, without compensation, participants had the opportunity to remain in the lab longer and work out using free weights. They were told that the next participant wouldn't be coming for at least 30 minutes and the lab was free for them to use. Participants who were in the critical, self-efficacy condition, exercised 10 times longer than participants in a number of control conditions.

Jesse Fox reported similar effects on healthy eating behaviours (Fox et al., 2009). In the virtual world, undergraduates viewed their doppelgängers eating candy and gaining weight, or eating carrots and losing weight. Subsequently, in the physical laboratory, participants remained in the room to complete a series of questionnaires with a bowl of candy nearby, and we unobtrusively measured how much candy they ate. The virtual eating behaviour of the doppelgänger subsequently affected physical eating. However, the effects varied by gender – men ate more candy after seeing their doppelgängers eat candy (compared to control conditions), while women suppressed the urge and consumed less candy. According to Fox, this stereotypical gender behavior was activated in the virtual world, and both genders adhered more voraciously to the stereotype, with men displaying large appetites and women behaving in a more diet-conscious manner.

False memories

Doppelgängers can also affect memory. Kathryn Segovia, another graduate student at Stanford's Virtual Human Interaction Lab, ran one of the more industrious studies in the history of virtual-reality research, placing fragile,

expensive equipment on the heads of scores of preschoolers and elementary-school children (Segovia & Bailenson, 2009). Segovia was interested in false memories. There is a large body of work on false testimony and eyewitness memory. Much of it has focused on children, because they are more suggestible than adults. Unfortunately,



innocent people have been imprisoned because of children's false memories. Previous work has demonstrated that if a child actively thinks about doing something, for example if the child is guided by a prosecutor to do so, the action can often become real to the child when asked about it later. Segovia's study examined whether witnessing a doppelgänger engage in a certain behaviour could produce a false memory. She built replica avatars of 60 children, who then watched 'themselves' swimming with whales in a virtual aquarium.

When interviewed a week later in the physical world, more than half of the elementary-school children who saw their doppelgängers swimming, compared to children who had seen other children's avatars swimming, persisted in the belief that they had physically gone swimming with whales sometime in the past. When asked to describe the experience, many had invented stories around the event, for example they could tell you what 'Sea

World' looked like and what they ate before swimming with the whales. Apparently, watching a doppelgänger can create false memories. The implications are profound. In virtual reality, just seeing oneself performing some action can change one's behaviour and memory.

Given that virtual behaviour is controlled by computer programmers and animators, the consequences can be dire. A recent study by the Kaiser Family Foundation (2010) in the US demonstrated that children between the age of eight and 18 spend over eight hours per day consuming digital media, much of that time spent playing video games that feature avatars. The line differentiating 'the real' from 'the virtual' is one that becomes less defined as more of life is conducted in digital forums.

Consumer behaviour

One such consequence is depicted in Steven Spielberg's adaptation of the Philip K. Dick short story *Minority Report*. Specifically, there was a scene in which Tom Cruise's character looked up at a billboard and encountered an advertisement using his own name. That marketing feat can certainly be recreated in virtual reality. We've demonstrated that if a participant sees his avatar wearing a certain brand of clothing, he is more likely to recall and prefer that brand. In other words, if one observes his avatar as a product endorser (the ultimate form of targeted advertising), he is more likely to embrace the product. There is a fairly large literature in psychology on the 'self-referencing' effect, which demonstrates that messages that connect with the receiver's identity tend to be more effective than generic messages (e.g. Rogers et al., 1977).

To explore the consequences of viewing one's virtual doppelgänger, we ran a simple experiment using digitally manipulated photographs (Ahn & Bailenson, 2011). We used imaging software to place participants' heads on people depicted in billboards using fictitious brands, for example holding up a soft drink with a brand label on it. After the study, participants expressed better memory as well as a preference for the brand, even though it was obvious their faces had been placed in the advertisement. In other words, even though it was clearly a gimmick, using the digital self to promote a product is effective. Based on the findings from this study, the Silicon Valley company LinkedIn is featuring job advertisements that pull

doppelgänger

the photograph of the job applicant and place it in the job advertisement. In other words, the applicant gets to 'see' what he or she would look like inside of the corporate message.

More human than human?

Doppelgängers allow for humans to have abilities that were never possible in the past.

Think about how often people multitask nowadays. For better or for worse, we are often mentally in more than one place at the same time, or at least travelling back and forth between many places psychologically very quickly, whether text messaging in movie theatres or chatting on the phone while driving a car. Think about identical twins, who have the unique ability to send a proxy to a boring meeting or to take a difficult exam. Avatars and agents take the notion of multitasking to a new plateau, and may free us up a great deal, via a virtual power we label outsourcing. For example, movie hero Bruce Willis, the physical version at least, has an active social life, attending parties in Hollywood and New York with other celebrities. But while Willis was enjoying his lunches and glitzy affairs in the summer of 2007, his agent clones were

promoting the movie *Die Hard 4*. A Bruce Willis doppelgänger was built and replicated. An army of these doppelgängers were sent into Second Life to walk around and convince people to see the movie. Not only can our avatars work while we sleep, but thousands of versions of our avatars can work simultaneously as we sleep (maybe, like Bruce Willis's, they're off performing a canned sales pitch to any number of potential clients). Imagine how much more persuasive, and useful, full-blown avatars and agents in virtual reality will be.

The National Science Foundation in the United States awarded a grant to a team of scientists headed by Jason Leigh at the University of Illinois at Chicago and his colleagues at the University of Central Florida. These scholars were tasked with developing the technology to build a lifelike visual appearance and personality replica of specific individuals. The goal of the project is to develop the technology needed to accomplish such a task. To test the feasibility of the technology, they chose to capture, preserve, and reuse the expertise of retiring NSF program director, Dr Alex Schwarzkopf (Lee et al., 2010). His doppelgänger is accurate in terms of appearance (they used a 3D scanner to make the avatar look like its owner),

nonverbal behaviour (meticulously recorded via motion-capture technology), personality (by using a vast array of artificial-intelligence natural language processing algorithms based on data collected during interviews with him), and emotions. One of the graduate students, who spent more than 30 hours per week with Schwarzkopf for a year, collecting data, noted that the doppelgänger even used speech idiosyncrasies, for example, his signature salutation, 'Keep the peace!' This system is somewhat functional and is being prepared for use by current, less senior NSF officials to leverage the expertise that Schwarzkopf achieved over decades of service. He has given them carte blanche to use his avatar as they see fit. The avatar actually learns from the people it meets because its understanding of the world at large changes based on history of previous conversations. In this sense, virtual Schwarzkopf is capable of forming relationships with people that physical Schwarzkopf never knew.

Conclusion

When a virtual human is controlled by an actual human's behaviours in real time, it is an avatar, by definition. If it is controlled by a computer, it is an agent. However, the notions of doppelgängers challenge these definitions, by begging the question, 'If it looks just like me in every way but is controlled by a computer algorithm, is it really just an agent?' Strictly speaking, the answer to this question is 'yes'. However, the notion of self is fluid in virtual reality. The same holds for people in the physical world, but to a lesser extent. 'I wasn't myself when I said that!' is an excuse people often give for some transgression.

The possibilities for self-representations are many in virtual reality, and scholars are just beginning to scratch the surface of understanding the implications of these new technologies for who we are and how we act as humans. There are many unknowns about these doppelgängers – for example, how long the effect lasts, how it interacts among people who vary across cultures and personality type, and what is the exact psychological mechanisms behind the process. As the technologies to build avatars move from the laboratory into the living room the need to answer these pressing questions will be more pronounced.

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Virtually greener

In a new line of work we are examining how to use doppelgängers to reduce energy use and promote 'green' behaviour. Take paper use as an example. People who use non-recycled tissue paper over the course of their lifetimes are personally responsible for cutting down virgin trees (approximately two large trees per person). In an initial study using first-person virtual reality rather than observation of doppelgängers (Ahn & Bailenson, 2011) about 50 people read some information about how the use of non-recycled paper leads to deforestation. One group of subjects then read an account of what happens when a chainsaw cuts down a tree. The narrative was rich with detail, describing the flight of birds in the forest, the sound and vibration of the saw and the breaking of branches. A second group of subjects didn't read the description, but instead entered a virtual forest via a head-mounted display that provided stereoscopic sight and spatialised sound. Also, using a special joystick called a haptic device, the subjects were able to feel the vibration of the virtual chainsaw in their hands.

Regardless of which group they were in, all participants said they planned to use less non-recycled paper in a self-report questionnaire. But when it came time to put that belief into practice, only the virtual tree choppers reduced their paper use, as measured by watching them clean up an 'accidental' water spill about 30 minutes later. Those who only read about logging used an average of 20 per cent more napkins than those who saw their limbs taken control of.

We are in the process of running a similar study using true third-person doppelgängers; the results await completion of analysis. In follow-up studies we are extending this work to and to other environmental domains, for example water use and carbon dioxide production.

A tissue – all cut down