Your Avatar, Your Guide

Seeing a digital doppelgänger can change your mind—for better or worse

By Samantha Murphy

Your favorite coffee shop is crowded with harried people, and you are standing shoulder to shoulder in a slow-moving line. Each jostling shift of the crowd aggravates your severe social anxiety. You start gasping for air; your heart quickens and you want to run.

But you force yourself to stay. You manage that feat only because you are not actually there. You are living this experience through your avatar, an animation that represents you in a virtual environment. In reality, you have never made it to the counter during the morning rush; instead you bolt out the door in a sweat. But you can get there on a computer. The experience of watching your digital look-alike uneventfully reach the front of the simulated line and order a pretend drink

Researchers at Stanford University created a doppelgänger avatar (*right*) of an undergraduate lab assistant, Felix Chang (*left*). Chang also built a fantastical avatar (*center*) to represent him in the virtual-world Second Life.
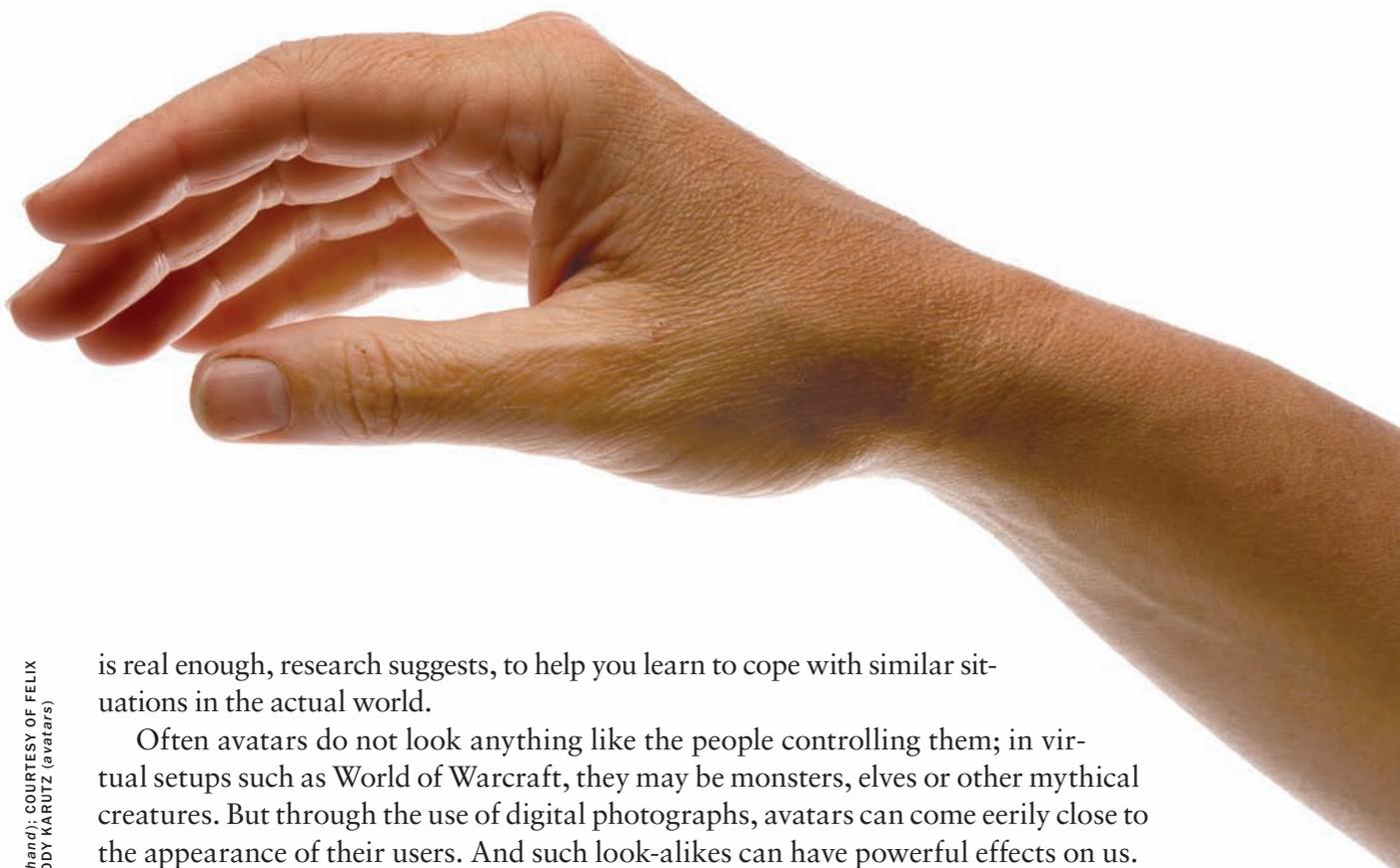
is real enough, research suggests, to help you learn to cope with similar situations in the actual world.

Often avatars do not look anything like the people controlling them; in virtual setups such as World of Warcraft, they may be monsters, elves or other mythical creatures. But through the use of digital photographs, avatars can come eerily close to the appearance of their users. And such look-alikes can have powerful effects on us.

Recent studies have demonstrated that watching an avatar that resembles you can influence your thoughts, feelings and actions, often for the better—a phenomenon dubbed the "doppelgänger effect." A mere three to five minutes of watching this digital representation of you—a kind of walking, talking photograph—can literally change your mind, improving your behavior in a social situation, calming your anxieties, swaying your views of a person or product, and helping you make better lifestyle or financial decisions.

Living Virtually

History shows us precursors of today's doppelgänger effect. For decades, if not centuries, educators and psychotherapists have used puppets and dolls to demonstrate appropriate or new behaviors to students and patients. Digital puppets—avatars, in other words—emerged in the early 1980s, when virtual personas appeared in television, movies and video games. Earlier in this decade, games such as The Sims and Second Life featured more realistic avatars that resembled people and could be customized.

Brain-imaging research suggests that people project themselves onto these avatars. In a study presented at the 2009 Society for Neuroscience meeting, social neuroscientist Kristina Caudle of Dartmouth College and her colleagues analyzed the brain activity of 15 hardcore gamers who spent an average of 23 hours a week as their avatars in World of Warcraft. When the gamers were given information about their avatars, their brains showed significantly more activity in a region called the medial prefrontal cortex [*see illustration at right*] than when they were thinking about people close to them, such as a best friend. The medial prefrontal cortex is concerned with processing high-priority "self-relevant" information. "This suggests that you're recruiting similar parts of the brain when you're thinking about the digital representation of yourself as you are when you're thinking of the real-life version of yourself," Caudle says. What is more, we remember information pertaining to ourselves better than we remember other types of data, which suggests that avatars can be a powerful learning tool.

Exposure to doppelgänger avatars, as opposed to the more fantastic kind, is likely to amplify this effect. According to a decades-old theory put forth by psychologist Albert Bandura of Stanford University,
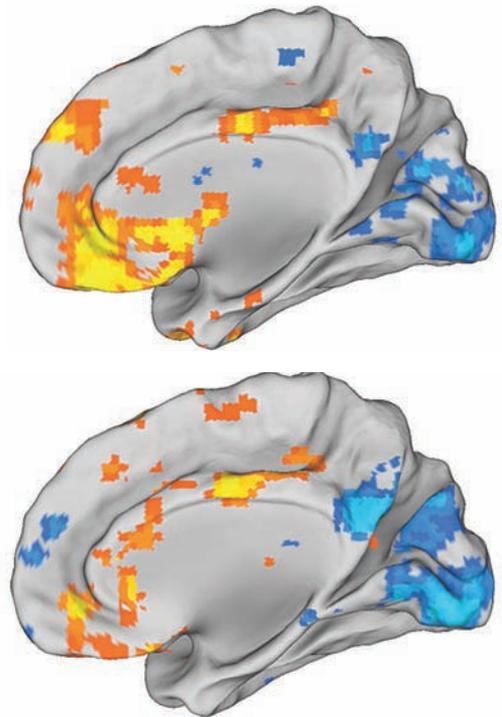
The author (*top*) fashioned a dark-haired female character to act on her behalf in the 3-D fantasy world Second Life.

When people think about themselves (*top*), they recruit brain regions similar to those activated when they process information about their avatars (*bottom*). Both situations elicit activity in the medial prefrontal cortex (*lower left, yellow and orange*), which is concerned with "self-relevant" information.

people learn from models, and the more the learner identifies with the model, the more effective the teaching. "These [doppelgänger] models work because they capitalize on something psychology has known for a long time," says Jesse Fox, a communications researcher at Ohio State University.

Doppelgängers can be as simple as a flat, stationary, stone-faced cartoon picture or as complex as a three-dimensional, emoting and interacting projection. Rather than a cartoon tweaked until it sort of resembles you, this latter type of animated replica bears your visage. It is built by wrapping a digital photo of your face around a 3-D head and then attaching that construction to a generic male or female cartoon body.

Digital Self-Help

Doppelgänger avatars allow you to see yourself perform a desired action, live out a fantasy or take on a slimmer, fatter or older form. For instance, they can help people to make smarter decisions about money. In a study currently in press, psychologist Hal Ersner-Hershfield, now at Northwestern University, and his colleagues created look-alike avatars of 50 participants whom they had digitally aged to 70 years old. Each user "inhabited" his or her avatar and peered

FAST FACTS
Animations on Our Minds

1» Through the use of digital photographs, doppelgänger avatars can come eerily close to the looks of their users and in doing so exert powerful effects on them.

2» Just three to five minutes of watching your digital double can improve your social skills, calm your anxieties and help you make better lifestyle or financial decisions.

3» Doppelgänger avatars can imbue users with new preferences and false memories.

Creating digitally aged avatars of individuals can give these people perspective, increasing the amount they save for retirement, for example.

out onto the virtual scenery from its perspective. Because of this viewpoint, researchers had some participants look in a virtual mirror to acquaint themselves with their senior selves while they answered questions known to enhance identification with an avatar, such as "What is your greatest fear?" and "What is your greatest hope?"

Participants were then told to allocate $1,000 to four purposes: a special occasion, someone else, a short-term savings account and a retirement savings account. Those who had seen their older avatars opted to put twice as much into their retirement account as those who answered questions but did not see their aged selves. In a similar study published in 2006, exposure to senior counterparts lessened participants' prejudices against older people, as assessed by a questionnaire, as compared with the attitudes of subjects who did not meet their digitally aged doppelgängers.

In addition to giving people perspective, doppelgänger avatars may be able to modify behavior by providing vicarious reinforcement. In a study published in 2009, Fox, then at Stanford, and her colleagues created avatar doubles for 69 college and graduate students who then watched their artificial selves eat in a virtual-reality environment. The avatar sat in front of a bowl of carrots and a bowl of chocolates. When the avatar ate chocolate, it got fat, and when it munched on carrots it slimmed down. Afterward, participants filled out a survey, which was placed next to a bowl of chocolates. The female participants who witnessed their avatars gaining and losing weight and felt immersed in the scenario consumed less of the available chocolate than did those whose avatars did not change or who did not buy into the virtual experience. Many of the women thought the visual reinforcement had altered their attitude and behavior. "Even though I really dislike carrots," one said, "I liked watching my-

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self get thinner, so watching the weight loss take place made me want to eat more healthily."

On the other hand, men who felt immersed in the experiment ate more chocolate than did men who found the virtual environment lacking. Researchers are not sure how to explain this difference between men and women but suspect the effect might be social: men who sit down to a meal with others tend to eat more than they do alone, whereas women who dine with company eat less. Participants seemed to be reacting to their doppelgängers as though they were dining with another person. Any incentive-based weight-loss avatar applications might have to address such subtleties. Nevertheless, Fox believes the technology is promising. "We got these effects from just three to five minutes of exposure," she says. "Who knows what would happen if people watched something like this every day?"

In a similar vein, avatar animations could motivate us to exercise. In another 2009 experiment by Fox's team, students who saw themselves as avatars running on a treadmill and becoming increasingly fit-looking engaged in more physical activity in the next 24 hours than did those who saw their avatars standing still, looking bored. Students with the active avatars reported walking more blocks, climbing more stairs and hitting the gym more than did their control counterparts. "These are powerful persuasive models that can get us to change behaviors that we may even be resistant to changing," Fox says, although she cannot yet say how long the effects of

(The Author)

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such interventions could last. Now she and her team are developing a program using photorealistic avatars that develop either benign moles or cancerous growths when exposed to the sun. It is designed to encourage users to protect their skin more reliably.

Psychologists and counselors have also begun using avatars to deliver therapy to clients who have phobias, a history of trauma, addictions, Asperger's syndrome or social anxiety. Indeed, almost a decade of research shows that virtual reality–based treatments are at least as effective as more traditional modalities, and "avatar therapy" is poised to be on the rise over the next few years. For instance, Stanford cognitive psychologist Jeremy Bailenson and psychiatrist Hoyle Leigh of the University of California, San Francisco, are studying the use of doppelgängers to teach people with schizophrenia, who have trouble making appropriate facial expressions, to smile. The program will show patients their avatar selves smiling in various situations.

Bailenson and psychologist Peter Mundy of the University of California, Davis, are also developing doppelgänger avatars that train people with Asperger's to make appropriate eye contact. When the subject embodies his or her avatar and looks into the eyes of another avatar, the avatar "friend" remains vivid. But when the subject's digital eyes look elsewhere, the other avatar starts fading away. By working to keep the other avatar visible (if only because that is the point of the game), patients will, the re-

searchers hope, learn to make and maintain eye contact in real life. Similar avatar programs could provide virtual social cues and stimulation to help people with social phobias (and those who are simply shy) gain courage to interact with others.

Cartoons in Control

Avatars can also be used for less virtuous purposes, such as making us feel more favorably disposed toward a product or political candidate than we might otherwise be. Already commercials feature actors who look, sound and act like the people in the community they target, to get consumers to envision themselves as owners or users of a particular product. A doppelgänger avatar might be an even more powerful way to accomplish the same goal.

In 2010 researchers at Stanford's Virtual Human Interaction Lab decided to test the power of avatars to influence consumers. They asked 80 students to log on to a Web site and watch virtual endorsements of fictitious soft-drink brands. Some brands appeared on billboards with text endorsements only; others were shown with a picture of a stranger or a picture of the participant as a spokesperson [*see illustration below*]. In a survey asking which brand participants preferred, most chose the one that appeared with their own image. This finding suggests that advertisers might benefit from poaching static images of individuals—from, say, social media sites such as Facebook—to personalize their pitches.

The most alluring spokesbeings of all, however, might be fully maneuverable doppelgänger avatars of the type featured in high-immersion virtual worlds such as Second Life. When Stanford students entered an immersive virtual setting featuring their doppelgänger in a soft-drink T-shirt, they highly endorsed the product on the shirt—provided they could control and manipulate their digital replica. (Students responded negatively, however, to doppelgängers they could only watch but not control; in this case, they opted for the competing beverage displayed on a stranger avatar's T-shirt.)

Such studies indicate the degree to which our opinions may be vulnerable to influence by anyone who decides to take and manipulate our digital image and put it before us. "Our identities are on the verge of becoming that mash-up of our physically real and virtual self or selves," says sociologist Sherry Turkle

> Avatar programs could provide **social cues and stimulation** to help people with social phobias gain courage to interact.

Personalizing advertisements with pictures of individuals could exert particular power over consumers. People preferred a brand of soft drink that appeared with their own picture to one accompanied by a photograph of a stranger or shown with only a text endorsement.

of the Massachusetts Institute of Technology.

Equally unsettling is the potential of avatars to imbue us with false memories. In 2009 Bailenson and Stanford communications researcher Kathryn Segovia told each of 27 preschool and 28 elementary school children a fictional story about the child's having once swum with two orca whales named Fudgy and Buddy. Then some of the children were told to spend a minute envisioning themselves swimming with the whales. Other kids watched their own doppelgänger avatar in the ocean with the mammals, and a third group saw another child in a virtual-reality enactment of the swim. A fourth group simply sat for a minute and waited. Five days later Segovia and Bailenson asked the children to describe their experience swimming with the whales and to judge whether the encounter had been real.

Nearly all the preschoolers thought they had actually swum with whales; such young children generally do not distinguish among real, virtual and imagined sources of information. More surprisingly, four of the seven elementary school children who had seen their avatar with the whales believed at least parts of the adventure to have been their own. Active visualization of the event was also convincing to the same proportion of these older children. (In contrast, watching a virtual representation of another child fooled only one of the kids.) Some of the children even embellished the avatar experience, with tales of playing hide-and-seek in coral reefs with the whales, for example. These findings indicate that in manipulating memories, showing children fictitious scenes involving doppelgänger avatars can be just as effective as coaxing them to imagine detailed scenarios that never happened.

Avatar experiences are likely to have a similar effect on the memories of adults, according to psychologist Elizabeth Loftus of the University of California, Irvine. People distinguish real memories from fake ones, she says, by recollecting details of sights and sounds. Thus, digital media embedded with these sensations can completely confound the memory. Loftus worries that viewing avatars might exert even more power over people's memories than fantasizing does. Fantasies require effort to create and thus may be more under a person's conscious control, she explains. In contrast, watching avatars is passive. "These kinds of images can invade you like a Trojan horse because you can't even detect that it's happening," she says. But even the potential of avatars to implant memories could be put to good use—if, say, the experience could link an aversive memory with an undesirable behavior, such as gorging on desserts, Loftus suggests.

Simulations involving look-alike avatars can implant false memories. In one study, schoolchildren who had simply viewed their avatar swimming with two orca whales later believed they had done so in real life.

Avatar-based programs seem ready to advance from experimental to commercial. Very soon you might be able to buy doppelgänger apps or video games to help you lose weight, understand the consequences of financial irresponsibility, develop your social skills, ease your anxieties or even promote cultural sensitivity. So far at least one exercise program is in early-stage commercial development. Further into the future, experts imagine, your psychotherapist may be someone on a computer speaking through an animated picture of your own face—after all, who can you trust more than yourself?

Other implications of such avatars may be far-reaching and unpredictable. "Seeing yourself do something that you've never done is something that, as humans, we've never experienced before," Bailenson says. As each of us becomes acquainted with our cyber-replicas, we may increasingly feel as if more than one of us exist. **M**

(Further Reading)

◆ **I, Avatar: The Culture and Consequence of Having a Second Life.** Mark Stephen Meadows. New Riders, 2008.
◆ **Lasting False Beliefs and Their Behavioral Consequences.** E. Geraerts, D. M. Bernstein, H. Merckelbach, C. Linders, L. Raymaekers and E. F. Loftus in *Psychological Science,* Vol. 19, pages 749–753; 2008.
◆ **Online Worlds: Convergence of the Real and the Virtual.** Edited by William Sims Bainbridge. Springer, 2010.
◆ **Infinite Reality: Avatars, Eternal Life, New Worlds, and the Dawn of the Virtual Revolution.** Jim Blascovich and Jeremy Bailenson. HarperCollins, 2011.
◆ **Self-Endorsing versus Other-Endorsing in Virtual Environments: The Effect on Brand Attitude and Purchase Intention.** S. J. Ahn and J. N. Bailenson in *Journal of Advertising* (in press). Preprint available at **http://vhil.stanford.edu/pubs/2010/ahn-ja-brand-attitude.pdf**