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The Effect of Embodied Experiences on Self-Other Merging, Attitude, and Helping Behavior

SUN JOO (GRACE) AHN
Grady College of Journalism and Mass Communication, University of Georgia, Athens, Georgia, USA

AMANDA MINH TRAN LE
Metaio, Inc., San Francisco, California, USA

JEREMY BAILENSON
Department of Communication, Stanford University, Stanford, California, USA

Immersive virtual environment technology (IVET) provides users with vivid sensory information that allow them to embody another person's perceptual experiences. Three experiments explored whether embodied experiences via IVET would elicit greater self-other merging, favorable attitudes, and helping toward persons with disabilities compared to traditional perspective taking, which relies on imagination to put the self in another person's shoes. Trait dispositions to feel concern for others was tested as a moderating variable. Participants in the embodied experiences (EE) condition were exposed to a red-green colorblind simulation using IVET while participants in the perspective taking (PT) condition were exposed to a normal colored IVET world and instructed to imagine being colorblind. Experiment 1 compared EE against PT and found that EE was effective for participants with lower tendencies to feel concern for others 24 hours after treatment. Experiment 2 delved further into the underlying process of EE and confirmed that a heightened sense of realism during the EE led to greater self-other merging compared to PT. Finally, Experiment 3 demonstrated that the effect of EE transferred into the physical world, leading participants to voluntarily spend twice as much effort to help persons with colorblindness compared to participants who had only imagined being colorblind.

Address correspondence to Sun Joo (Grace) Ahn, University of Georgia, Grady College of Journalism & Mass Communication, 120 Hooper Street, Athens, GA 30602-3018. E-mail: sjahn@uga.edu

> "Tell me Craig, why do you like puppeteering?"
>
> "Well Maxine, I'm not sure exactly. Perhaps the idea of becoming someone else for a little while. Being inside another skin—thinking differently, moving differently, feeling differently." –Craig Schwartz, *Being John Malkovich*

This quote from a 1999 fantasy film, *Being John Malkovich*, refers to a mental process called perspective taking. In this film, people enter a portal that leads into the mind of John Malkovich and see, hear, and feel through his body, using Malkovich's body as a live puppet. The portal in the film is a fantastical depiction of the cognitive process of perspective taking, or imagining oneself in the shoes of another. Psychologists have discovered that perspective taking encourages a host of favorable outcomes, such as stereotype reduction (Batson et al., 1997) learning (Siegler, 1995), and improved interpersonal communication (Fussell & Krauss, 1989).

Despite the benefits of perspective taking, mentally putting oneself in the shoes of another requires extensive cognitive effort (Hoffman, 1982) and individuals may differ in their ability and motivation to engage in this activity (Davis and Kraus, 1997; Gehlbach, 2004). This article proposes using immersive virtual environment technology (IVET) to enable individuals to easily and effectively experience the world from another person's point of view. With novel affordances such as multisensory inputs and naturalistic control of point of view, IVET allows for a literal demonstration of climbing into another person's skin to embody his or her experiences first hand. Vivid, multilayer perceptual information simulated by digital devices enable individuals to see, hear, and feel as if they were undergoing the sensory experiences in the physical world—what we call "embodied experiences." Using IVET, embodied experiences allow the user to experience the closest realization of the portal to enter another person's mind and body.

Our main focus of investigation was on the potential of embodied experiences through IVET to foster greater self-other merging with persons with disabilities; increase favorable attitude toward them; and assess whether the influence of these experiences could transfer to the physical world, leading to actual helping behavior. These effects were compared against traditional perspective taking methods that rely on imagination to assess the strengths and weaknesses of embodied experiences through IVET.

PERSPECTIVE TAKING, A CATALYST TO HELPING BEHAVIOR

Humans are social animals who spend much of their lives interacting with others. Perspective taking facilitates social interaction by helping people establish common grounds and infer shared knowledge and beliefs between

interactants (Krauss & Fussell, 1991). Scholars argue that humans are hard-wired to help others in need, as are few other large-brained species such as orangutans or dolphins (de Waal, 2008). It has been demonstrated that sharing the same basis of feelings and thoughts of another person through perspective-taking can even lead to costly self-sacrifice during helping (Batson, 1991; de Waal, 2008).

People often engage in perspective taking through mentally merging the self with the other, a process in which the other is considered to be more self-like. For instance, upon being instructed to take the perspective of a stranger, individuals demonstrated a tendency to project positive self-relevant traits to the stranger and used the positive self-traits to describe him or her (Davis, Conklin, Smith, & Luce, 1996). Much in the same way, instructing individuals to take the perspective of a member of a certain social category (e.g., elderly) led them to describe that member with trait words that they used to describe themselves (Galinsky & Moskowitz, 2000). Cialdini, Brown, Lewis, Luce, and Neuberg (1997) suggested this merging is enhanced when individuals recognize cues related to genetic relatedness or close attachment, and Aron, Aron, and Smollan (1992) proposed that people in close relationships such as spouse or family have highly overlapping mental representations of one another.

This phenomenon can be mimicked even with unfamiliar persons by establishing close attachment cues via perspective taking. Cialdini and colleagues (1997) termed this sense of shared identity through self-other merging as *oneness*, and demonstrated that when individuals are led to feel oneness with another person via perspective taking, greater intentions for helping emerge. Goldstein and Cialdini (2007) also went on to show that when oneness is heightened through perspective taking, individuals begin to behave as the other person would, and that this change in behavior is fully mediated by self-other merging.

However, perspective taking is a controlled, effortful process that requires substantial cognitive resources (Davis et al., 1996) and can be challenging to achieve. When individuals fail to understand and share the other person's thoughts and feelings through perspective taking, they will not engage in helping behavior unless there are clear benefits from helping (Batson, 1991). The cognitive challenge of perspective taking may be even less appealing when individuals have low motivation to engage in an effortful mental task (Gehlbach, Brinkworth, & Wang, 2012; Hodges & Klein, 2001; Webster, Richter, & Kruglanski, 1996).

Even if a person attempts to take on the cognitive challenge of perspective taking to mentally put themselves in another person's shoes, he or she may fail to fully grasp the urgency or the reality of the other person's situation. For instance, it has been demonstrated that people underestimated how thirsty they would be after exercising when they were asked to merely use their imagination. But when they were asked to make the same estima-

tion after an actual exercise session, they expressed a significant increase in their estimation of how much they would crave water in similar future situations (Van Boven & Loewenstein, 2003). Regardless of best efforts to put themselves in the situation, people generally have a difficult time fully appreciating the true nuances of the situation unless they are living the situation in that moment. This article explores how IVET may aid people to overcome such shortcomings of perspective taking by allowing them to experience the vivid nuances of another person's situation, and how that may lead to more favorable outcomes than traditional perspective taking.

EMBODIED EXPERIENCES THROUGH IMMERSIVE VIRTUAL ENVIRONMENT TECHNOLOGY

IVET is a mediated environment simulated by digital computer technologies that blur the distinction between reality and its virtual representations (Blascovich et al., 2002). The system used for the current experiments was comprised of a head-mounted display (HMD), a headpiece with screens that provide a stereoscopic view of the computer-generated world, and devices that track physical movements of the head in three-dimensional space. Stereoscopic view enables users to see depth. Users also had head-controlled point of view, meaning that they were able to look around naturally in the virtual world as they would in the physical world.

These novel affordances offer an innovative way to facilitate perspective taking by allowing the user to experience vivid sensory information firsthand. With rich layers of sensory information, users feel a high sense of presence, or the perception that the mediated virtual environment is real (Loomis, 1992; Slater & Wilbur, 1997). Biocca (1997) notes that, by digitally recreating and extending the human sensory capabilities, virtual stimuli lead the mind to temporarily accept the illusion of sufficiently realistic experiences. Real experiences in the physical world become associated and stored with existing memories and these memories are later activated and recalled when the individual encounters or thinks about similar stimuli (Barsalou, 2009). In much the same way, the realism of virtual experiences is likely to produce mental schema about the simulated event as if he or she had firsthand experience of it, to be recalled later when necessary.

The concept of putting oneself in another's shoes to vicariously share experiences using media is not new. Even a print medium that presents no simulated sensory information can feel relatively realistic when an individual becomes deeply engaged (Green, 2004; Green, Brock, & Kaufman, 2004). However, no other medium to date has been able to replicate the degree of realism that IVETs offer. Furthermore, research exploring the potential of applying IVETs to perspective taking has been sparse and is even more so for motivating helping behavior.

Earlier IVET studies have investigated the effect of embodying only the physical traits of another person and found that it modifies behavior (Yee & Bailenson, 2007). Termed the "Proteus Effect," results demonstrated that spending several minutes in a virtual world embodying a tall virtual self-representation (i.e., an avatar) led participants to choose more aggressive strategies in a negotiation task compared to participants who were given short avatars. Similarly, participants given attractive avatars were more confident in interacting with a stranger compared to those given unattractive avatars (Yee & Bailenson, 2009; Yee, Bailenson, & Ducheneaut, 2009).

Kalyanaraman, Penn, Ivory, and Judge (2010) conducted a relevant study that motivated the current experiments, comparing the embodiment of schizophrenic experiences in a virtual schizophrenia simulator that simulated visual and auditory hallucinations against traditional manipulations of perspective taking. They compared four different conditions—perspective taking instructions only; virtual simulation only; both perspective taking instructions and virtual simulation; and a control condition that did not receive either treatment. Results indicated that having participants think about schizophrenia through perspective taking as well as having them experience the simulation was more effective in terms of constructing more favorable attitudes toward persons with schizophrenia compared to participants who engaged in just the virtual simulation or just perspective taking. This seems to be a different process of self-other merging than the process of self-perception as suggested by the Proteus Effect (Yee & Bailenson, 2009), which would anticipate that participants would act in a manner similar to a schizophrenic person after the virtual simulation. The current experiments aim to advance these findings by exploring the process of self-other merging elicited by embodied experiences through IVET in the context of disabilities, more specifically red-green colorblindness.

Moreover, self-report measures might not be sufficient evidence to conclude that helping behaviors will be exhibited as a result of perspective taking. We attempted to go beyond assessing the effect of embodied experiences based solely on surveys and gauged actual helping behavior. Earlier work exploring the power of embodied experiences in IVET demonstrated behavioral changes in terms of paper conservation (Ahn, 2011). However, helping a person is contextually different from helping the environment and may lead to unforeseen differences.

Finally, perspective taking is a cognitive activity, subject to individual differences in capacity and ability. Some people are inherently more likely to feel concern for another person in need (Matthews, Batson, Horn, & Rosenman, 1981; Rushton, Fulkner, Neale, Nias, & Eysenck, 1986). Not only does this individual difference in predisposition to care for others influence their tendency to engage in perspective taking (Davis, Luce, & Kraus, 1994), but it also impacts how individuals respond to IVET simulations; that is, individuals predisposed to feel greater concern for others tend to experience

higher levels of presence and feel that the virtual world is real (Sas, 2004; Sas & O'Hare, 2003; Wallach, Safir, & Samana, 2010). Thus, the current experiments will also take trait differences in feeling concern for others into account as a potential moderator.

OVERVIEW OF EXPERIMENTS

Three experiments compared traditional perspective taking against embodied experiences using IVET. Red-green colorblindness, a visual disability that causes the inability to perceive differences between red and green, was chosen as the context of perspective taking in all three experiments to simulate a novel experience to control for the confounding effects of prior experience. Thus, the question of interest was whether embodied experiences would better promote greater self-other merging compared to traditional perspective taking in an unfamiliar situation with an unfamiliar person. In addition, the experiments sought to measure attitude change in terms of reduced prejudice against persons with red-green colorblindness. Most importantly, we were ultimately interested in the possibility of encouraging actual helping behavior; that is, the current experiments aimed to investigate whether embodied experiences within the virtual environment would be powerful enough to transfer the effects into the physical world in the form of providing actual help toward people with red-green colorblindness. Individual predisposition to feel concern for others was included in all three experiments to study how it moderates the effects of embodied experiences or perspective taking.

Experiment 1 was an exploratory investigation that pitted embodied experiences against traditional perspective taking. The main aim of the first experiment was to test the effectiveness of embodied experiences using IVET and whether it would outperform traditional perspective taking in terms of self-other merging (i.e., oneness), attitude toward persons with colorblindness, and actual helping behavior. Building on these results, Experiment 2 delved into underlying mechanisms to study the process of self-other merging in greater detail. The main aim of the second experiment was to discover the element of embodied experiences that set it apart from traditional perspective taking. Finally, Experiment 3 leveraged some insights from the first two studies and improved the measure of helping people with red-green colorblindness.

In all three experiments, all participants first received basic information about red-green colorblindness. Participants assigned to the embodied experience condition wore a HMD with a colorblind filter applied over the objects on the screen, which allowed them to accurately experience being red-green colorblind. Participants assigned to the perspective tak-

ing condition also wore the HMD but viewed the screen in normal colors while being told to mentally put themselves in the shoes of the colorblind individual.

EXPERIMENT 1

Experiment 1 explored the effectiveness of embodied experiences by comparing traditional perspective taking (PT) against embodied experiences (EE). Based on the discussion above regarding cognitive challenges of traditional PT and the ability of IVET to deliver a vivid sensory-rich experience that mimics climbing into someone else's skin, we anticipated:

H1: EE will elicit greater perceived oneness with the target compared to traditional PT.

The result of better self-other merging, as demonstrated through greater oneness, was expected to be manifested in actual helping:

H2: EE will elicit greater helping behavior toward the target compared to traditional PT.

Furthermore, the vivid experience of the disability in IVET was anticipated to reduce prejudice toward colorblind individuals even after some time had passed:

H3: EE will elicit more favorable attitudes toward the target compared to traditional PT that last up to 24 hours following the experimental treatment.

Finally, individual differences in predispositions to care for others were expected to moderate the effect of EE and PT to some degree:

RQ1: How will individual predispositions to care for others impact the effect of EE and PT on oneness, attitude, and helping behavior?

METHOD

Participants

A sample was recruited from the student population of a medium-sized university. The sample ($N = 44$)[1] consisted of 20 males and 24 females aged 18 to 69 ($M = 22.57$, $SD = 8.75$).[2]

Apparatus

Three computer stations were involved in the experimental setup: the participant's computer, where the participant was exposed to the EE or PT treatments; the confederate's computer, where a research assistant was posing as a colorblind person; and the survey computer, where the participant filled out questionnaires.

At the participant's computer, participants donned a HMD through which they were able to view the stimulus. The HMD presented the virtual environment with 640 horizontal by 480 vertical pixel resolution panels for each eye. Participants' head movements were tracked by a three-axis orientation sensing system (Intersense IS250 with an update rate of 150 Hz) and used to continuously update the simulated viewpoint. The system latency, or delay between the participant's movement and the resulting update in the HMD, was no greater than 80 ms. Vizard 3.0 software was used to assimilate tracking and rendering.

The confederate's computer was equipped with the Sensable Phantom Omni haptic device with six degrees of freedom (x, y, z, pitch, yaw, and roll). The haptic device allowed confederates to 'touch' objects in the virtual world by providing mechanical resistance based on the position of the hand as it interacted with the virtual environment. The confederate and participant's computers were networked so that the participant at the computer could see any movement on the confederate's screen in real-time. Figure 1 depicts the experimental setup.

Design and procedure

Pretest. Approximately 48 hours prior to coming into the lab, all participants filled out a pretest (Interpersonal Reactivity Index [IRI]; Davis, 1980). This 28-item questionnaire is comprised of four 7-item subscales: perspective taking, fantasy, empathic concern, and personal distress. Combined, the four subscales yield a comprehensive picture of individual predispositions to put oneself in another's person's situation and react to that person's needs. Each item was measured by a fully labeled 5-point scale (1 = *does not describe me well*; 5 = *describes me very well*). The 28 items had a Cronbach's alpha level of .78 and were averaged to create a composite IRI score. The IRI scores ranged from 2.32 to 4.07 ($M = 3.16$, $SD = .35$).

Experiment. During the actual experiment, participants were randomly assigned to either the EE or PT condition. Participants in both conditions received identical explanations about colorblindness, such as basic statistics, a short description of how colorblind people are unable to differentiate between red and green, and how this could affect their lives.

The main experimental task was a color matching exercise in which participants matched red or green colored screws with red or green colored holes on a board. To clearly present the target of perspective taking, a

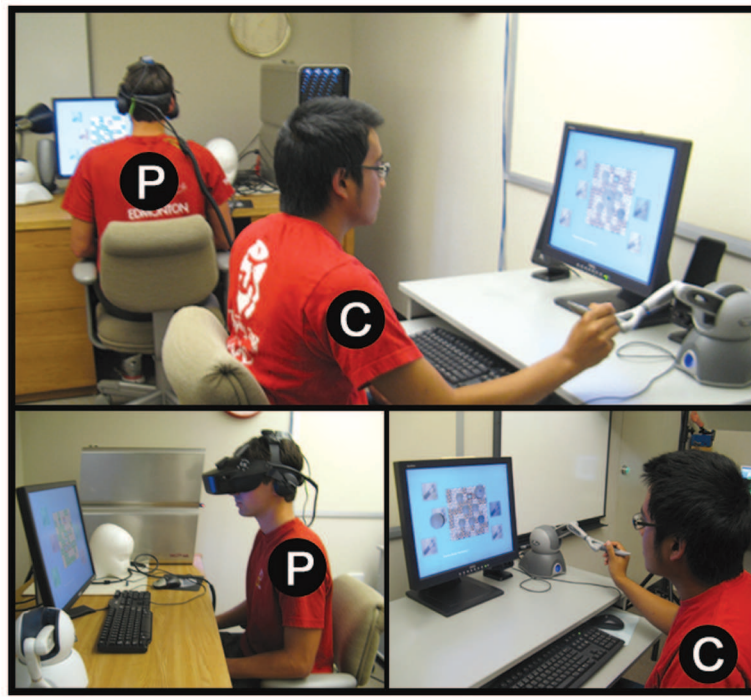

FIGURE 1 Top row: the experimental setup with participant (denoted P) and confederate (denoted C) computer stations. Bottom row: close-up of participant wearing the HMD (left), close-up of confederate using the haptic device. (Figure available in color online.)

same-sex confederate posed as a colorblind student. The cover story informed participants that the colorblind confederate was "training to differentiate red and green." The participants were asked to help this confederate in training since the colorblind student would be unable to differentiate the colors of the screws and the holes at first. Participants were instructed to verbally guide the confederate through the task (e.g., "move the screw up") while the confederate moved the screws with the haptic device.

Participants gave verbal instructions to the colorblind confederate for two sets of five boards, each board taking about one minute to complete. The first set, presented as the practice set, was the treatment. Wearing the HMD, participants in the EE condition completed the boards in the colorblind perspective, which displayed the objects treated with a colorblindness filter, rendering them as seen by a colorblind individual. In other words, in the EE condition, participants embodied the vivid sensory experience of being colorblind and were unable to discriminate red objects from green objects. Participants in the PT condition also wore the HMD and completed the same boards in the normal color perspective while imagining being colorblind.

Then, all participants gave verbal guidance to the confederate to complete the second set of boards which were presented to them as the actual training set. This second set was a filler task, administered to bolster the cover story of training the colorblind student after practice on the first set. Once the second set of boards was completed, participants were taken out of the HMD and led to the survey computer station where they filled out surveys. As thinking about the disability seemed to be an integral part of the manipulation that made the virtual schizophrenia simulation effective in the Kalyanaraman et al. (2010) study, all participants were asked to write down their thoughts on either embodying the experience of being colorblind or taking the mental perspective of being colorblind before moving on to answer survey questionnaires.

Upon completion of survey questionnaires, the researcher indicated that the experiment was over and that the participant was free to leave at any time. To confirm the termination of the experiment, all participants were paid at this point. The researcher then thanked the confederate for participating in the training, explicitly stating that they were welcome to stay as long as necessary to continue practicing with the color-matching program. Then, the researcher left while the participant was still in the room.

The confederates were instructed to wait until the participant was ready to leave, and then ask the participant for help: "I think I still need some practice on trying to match the colors. I know the experiment is finished but can you stay and help me some more?" It was evident that the experiment was over and the researcher was no longer overseeing the experiment. Therefore, the extra number of boards completed by the participant after this point is a measure of voluntary helping behavior. The confederates were blind to the experimental conditions and carefully followed a preconstructed script that was identical for all conditions. Further, confederates were instructed to allow the participant to leave whenever they desired.

Posttest. An online follow-up survey assessing the participant's prejudice toward colorblind people was administered 24 hours after termination of all experimental procedures.

Dependent measures

Manipulation check. Two items measured the success of the participant taking the perspective of the colorblind target through either EE or PT: "How colorblind did you feel during the practice session?" and "How difficult was it to complete the color matching task during the practice session?" Responses were measured with fully labeled 5-point Likert scales. The two items were highly correlated (Pearson's r and p-value = .88) and were averaged.

Oneness. The Inclusion of Other in the Self Scale measured how close the participants felt to the confederate. Developed by Aron and colleagues (1992), this scale depicts seven drawings of increasingly overlapping circles,

anchored by the first picture of two non-overlapping circles and the seventh picture of two almost completely overlapping circles. The participant was instructed to choose the picture that best depicted the extent to which he/she felt connected to and 'at one with' the confederate. This is a measurement of the participants' perceived similarity with the target (Maner et al., 2002).

Helping. This is the number of boards completed upon the confederate's request for help after the researcher had left. Unbeknownst to the participant, the program was still running and counting the number of completed boards. As the participant was well aware that this would be uncompensated work, the number of extra boards may be seen as voluntary helping behavior.

Attitude. This was a 10-item survey adapted from the Attitude Toward Disabled Persons Survey (Yuker, Block, & Younng, 1966), a widely used scale to determine the extent to which people perceive disabled people as inferior to people without disabilities. Ten items were taken from the original scale and the word "disabled" was replaced with "colorblind." For instance, if the original item was, "Disabled people are just as self-confident as other people," we adapted this to "Colorblind people are just as self-confident as other people." A fully labeled 6-point Likert-scale presented these statements manifesting either negative or positive attitudes toward colorblind people (−3 = *I disagree completely*; 3 = *I agree completely*). Thus, a higher score on this attitude scale implies greater reduction of prejudice, while a lower score on the scale implies lesser reduction of prejudice. The reliability of these 10 items had a Cronbach's alpha value of .77 and were averaged to create a comprehensive measure of general attitude toward colorblind people.

Results

Manipulation check

An independent samples t test compared means of the manipulation check scores between the EE and PT conditions. The Levene's test was significant and results were interpreted without assuming equal variances. Results of the t test was significant, $t(23.76) = 7.03$, $p < .01$, $d = 2.22$, confirming the success of the manipulation of EE in delivering a vivid sensory experience of being colorblind. Participants who embodied the experience of being colorblind felt significantly more colorblind ($M = 3.50$, $SD = 1.32$) and thus the color matching task became significantly more difficult for them than participants who imagined being colorblind ($M = 1.30$, $SD = .47$).

Descriptive statistics of all other dependent measures are given in Table 1, and detailed results of all regression tests to be discussed in the following pages are displayed in Table 2.

TABLE 1 Descriptive Statistics for Dependent Measures in Experiment 1 ($N = 40$)

		M	*SD*	Minimum	Maximum
Oneness	EE	4.35	1.79	1.00	7.00
	PT	4.00	1.81	1.00	7.00
	Total	4.18	1.78	1.00	7.00
Helping	EE	19.50	16.80	2.00	55.00
	PT	23.80	17.34	2.00	55.00
	Total	21.65	16.99	2.00	55.00
Attitude	EE	1.81	.51	1.00	3.00
	PT	1.51	.81	.10	2.60
	Total	1.66	.69	.10	3.00

Oneness

Next, a linear regression was conducted with oneness as the dependent variable and the experimental conditions (EE vs. PT), IRI, and their interaction term as the predictors. The experimental condition variable was dummy coded with 0 (PT) and 1 (EE), and IRI scores were centered. As shown in Table 2, both the main effects of experimental condition and IRI had positive but nonsignificant coefficients. The interaction between experimental condition and IRI was significant. The change in incremental R^2 value after adding the interaction term was significant with the interaction term adding 12% of R^2 change. Following the guidelines set forth by Aiken and West (1991), the effect of IRI's moderation on oneness is depicted in Figure 2. Figure 2 and the negative coefficient value of the interaction term imply that the difference in oneness from EE and PT was larger for participants with lower IRI. For these participants, EE was more effective than PT in eliciting higher oneness. The difference in oneness fostered by EE or PT was smaller for participants with higher IRIs and PT was more effective than EE for them. Therefore, Hypothesis 1 was only partially supported.

Helping

A regression was conducted with the number of extra boards completed as the dependent variable and the same predictors as above. As shown

TABLE 2 Regression Analyses for Dependent Measures in Experiment 1 ($N = 40$)[a]

	Experimental condition	IRI	Condition × IRI
Oneness	.11	.30	−.56*
Helping	−.12	−.64*	.69**
Attitude	.21	.60*	−.52*

[a]Cell entries refer to the standardized regression coefficient.
*$p < .05$, **$p < .01$.

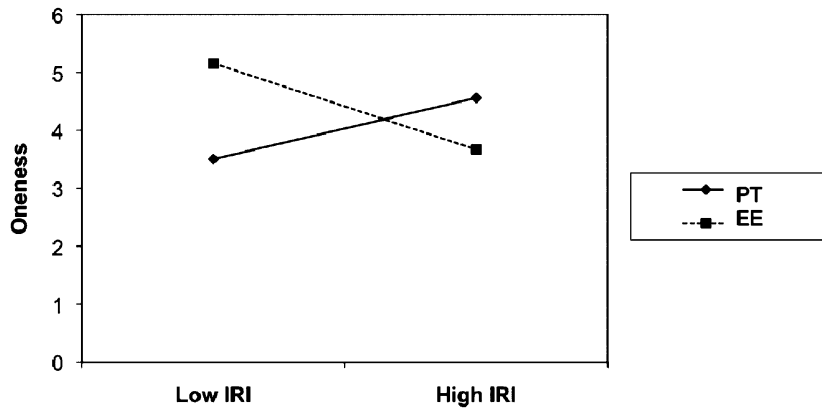

FIGURE 2 Interaction between experimental condition and IRI in predicting oneness.

in Table 2, the main effect of experimental condition had a negative but nonsignificant coefficient. The main effect of IRI was significant—participants with lower IRI scores offered more help to the colorblind confederate. The interaction between experimental conditions and IRI was also significant, as displayed in Figure 3. Adding the interaction term to the model significantly increased the R^2 value by 18%. The difference in helping behavior elicited by EE and PT was greater for participants with lower than with higher IRI. For participants with lower IRI, traditional PT elicited greater helping than EE. The difference between experimental conditions was smaller for participants with higher IRI, for whom PT seemed more effective than EE. Hypothesis 2 was not supported.

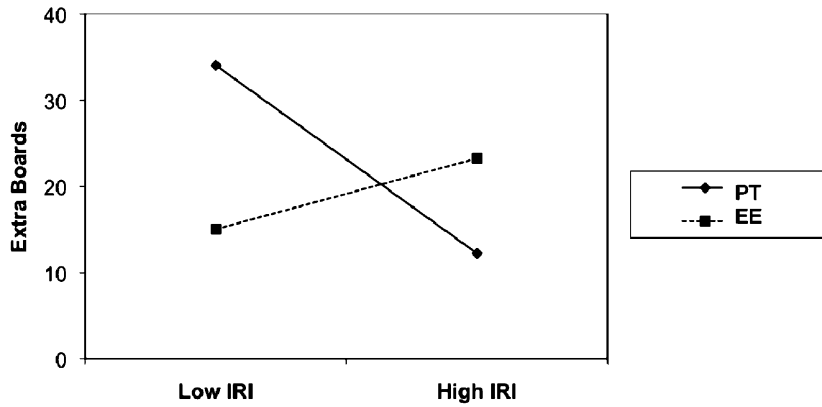

FIGURE 3 Interaction between experimental condition and IRI in predicting helping behavior.

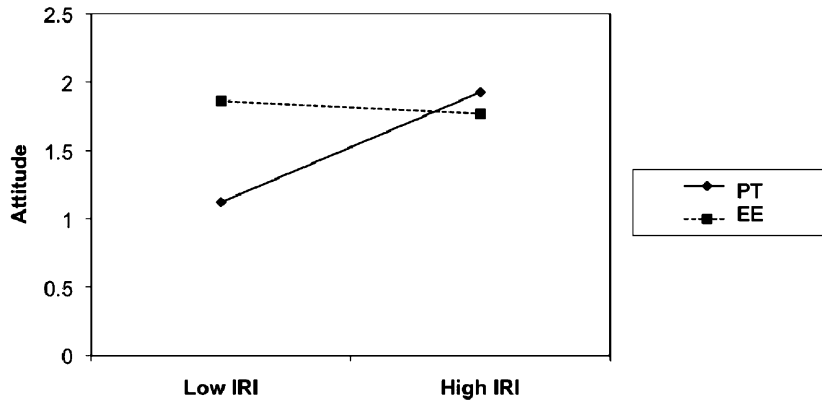

FIGURE 4 Interaction between experimental condition and IRI in predicting attitude toward people with colorblindness 24 hours after the experimental treatments.

Attitude

Finally, a regression was conducted with attitude as the dependent variable and the same predictors as above. The main effect of experimental condition had a positive but nonsignificant coefficient. On the other hand, the main effect of IRI was a significant predictor of attitude, implying that participants with higher IRI scores had more favorable attitude toward people with colorblindness (i.e., greater reduction of prejudice) 24 hours after the experimental treatments. The interaction was also significant, as shown in Figure 4. Adding the interaction term to the model significantly increased the R^2 value by 10%. The effect was largely driven by participants with lower IRI in the PT condition, who displayed the least favorable attitude toward people with colorblindness 24 hours after the treatment. This also implies that EE fostered relatively high levels of attitude regardless of individual differences in IRI. On the other hand, participants exposed to the PT condition had to have higher IRI to demonstrate an equally high level of attitude. Hypothesis 3 was partially supported.

Discussion

These results imply that embodying the experience of being colorblind has notable effects, particularly on participants with lower IRI. For those participants, EE enhanced the feeling of merging with the colorblind confederate compared to traditional PT. Furthermore, participants with lower IRI exposed to EE indicated more favorable attitudes—or reduced prejudice—toward people with colorblindness 24 hours after the treatment compared to participants with higher IRI. It should be noted that this longer-term effect resulted in positive attitudes toward not just the colorblind confederate that the participants interacted with in the laboratory, but toward the colorblind

population in general. Considering that the duration of the EE treatment was approximately five minutes, the fact that the effect transferred outside the laboratory 24 hours after the treatment is meaningful.

Individual differences in IRI also moderated the effect of experimental treatments on helping behavior, but exposing participants with lower IRI to EE actually led to less helping compared to traditional PT. One possible explanation is our failure to construct a believable task; that is, the IVET manipulation may have been so vivid that the helping task seemed implausible particularly after the EE treatment. When participants saw firsthand in the EE condition how completely indistinguishable the colors are to a colorblind person, they may have felt that the confederate's state was far more serious than they had imagined and that extra practice would be futile. Conversely, participants relying on imagination in the PT condition may have not realized the severity of the disability and may have had unrealistic optimism in their ability to help the colorblind student, thus spending more time helping. We revisit this anomaly by redesigning the helping task in the next two studies.

Because IRI's moderation of the helping behavior was at odds with how it affected oneness and attitude, IRI's role as a moderator is inconclusive. Similarly, IRI's main effect is also inconclusive as participants with higher IRI were less likely to help, but displayed more favorable attitude 24 hours after the experimental treatment. Despite inconsistencies, the fact that we were able to obtain strong interaction effects in all three measures with a small sample size is encouraging and merits further investigation.

EXPERIMENT 2

A follow-up experiment was conducted with a larger sample to delve deeper into the underlying mechanism of EE and how its effects on oneness, attitude, and helping may be moderated by IRI. Based on the results of Experiment 1 and the earlier discussion on prior work demonstrating correlations between IRI scores and the perception of presence, we expected that the moderated effect of EE on increased oneness would be related to the level of presence; that is, the vivid sensory information of EE is expected to heighten the sense of realism of the experience. The heightened sense of realism is, in turn, expected to lead participants to feel that they have truly climbed into the skin of, or are at one with, a colorblind person. Thus, Experiment 2 first aims to replicate Hypothesis 1 from Experiment 1, but with IRI moderating the effects as Experiment 1 implied that EE was more effective in eliciting oneness among participants with lower IRI:

H4: EE will elicit greater oneness with the target compared to traditional PT in participants with lower IRI.

The following is also hypothesized regarding the underlying mechanism of EE:

H5: Perceived level of presence will mediate the relationship between experimental conditions and oneness.

Furthermore, we chose an improved assessment of helping with greater feasibility than what was used in Experiment 1—helping to identify and enhance Web sites that would be problematic for colorblind individuals. This task was more believable in comparison to the task in Experiment 1 because it did not involve any claims to treat or improve the disability. The help provided by participants would offer realistic aid to people with colorblindness who use the Internet:

H6: EE will elicit greater helping behavior compared to traditional PT in participants with lower IRI.

Finally, we also expected that EE's effect on attitude toward people with colorblindness 24 hours after the treatment will be replicated and that IRI will moderate the effect, as demonstrated in Experiment 1.

H7: EE will elicit less prejudice toward colorblind people compared to traditional PT in participants with lower IRI.

Method

Participants

A sample was recruited from the student population of a medium-sized university. The sample ($N = 97$) consisted of 44 males and 53 females aged 18 to 36 ($M = 21.59$, $SD = 3.00$).

Apparatus

The same devices from Experiment 1 were used.

Design and procedure

Pretest. The same IRI scale from Experiment 1 was used as a pretest. The 28 items had a Cronbach's alpha value of .79 and were averaged to create a comprehensive IRI score. The IRI scores ranged from 1.89 to 4.25 ($M = 3.31$, $SD = .39$).

Experiment. The same design from Experiment 1 pitting EE against PT was used, but rather than using an in-person confederate, Experiment 2 introduced the same-sex colorblind confederate from Experiment 1 with a color photograph to provide a specific target of perspective taking for the participants. Numerous prior studies have used static forms of target representation such as photographs (Galinsky, Wang, & Ku, 2005). Because they did not have a live confederate in the same room, participants were told to complete the boards themselves for the color-matching task instead of giving verbal guidance to the confederate as in Experiment 1. Thus, all participants wore the HMD and had control of the haptic pen. All other instructions and procedures were identical with Experiment 1 with the exception of the new helping task.

The helping task in this experiment involved participants reading a short text message on the computer from a student group that was supposedly trying to build colorblind friendly Web sites. The task required them to view screenshots of Web sites and to write about why the Web site may be inaccessible to colorblind individuals and how it may be improved. It was made clear to the participants that this activity was not a part of the experiment and that it would be volunteer work. The researcher left the room at this point, instructing the participant to leave whenever they wished to go.

If a participant agreed to participate, they clicked on a next button. The computer walked the participant through instructions and presented a picture of a Web site with a textbox. There was a quit button on the screen that participants could click at any point to leave the experiment. Time stamps were gathered from the point the participant clicked on "next" to begin the activity to the point where the participant clicked on "quit." Also, anything typed into the textbox was recorded for further analyses. The time spent and the number of words written for this uncompensated activity was a measure of helping toward colorblind people in general.

Posttest. The same attitude scale from Experiment 1 was administered 24 hours following the experimental treatments.

Dependent measures

Manipulation check. The same two items from Experiment 1 measured the success of the participant taking the perspective of the colorblind target through either EE or PT. The two items were highly correlated (Pearson's r and p-value = .92) and were averaged.

Oneness. The same Inclusion of Other in the Self Scale from Experiment 1 was used.

Presence. Five items gauged how vivid and realistic the experiment treatment felt by asking participants the extent that they felt the colorblind was happening to them; they were in the colorblind person's body; they were

colorblind; they felt they could reach out and touch the red and green screws; they felt that the screws and the board were real. These items were culled from several sources (Bailenson & Yee, 2007; Nowak & Biocca, 2003; Witmer & Singer, 1998) and have been tested in other comparable experiments (Fox, Bailenson, & Binney, 2009). Participants used fully labeled 5-point Likert scales (1 = *not at all*; 5 = *completely*) to rate their perceptions of realism. The items had high reliability ($\alpha = .79$) and were averaged to create a single composite measure.

Helping. The total number of seconds that the participants invested in the volunteer activity was calculated to determine the degree of helping behavior. The duration of time invested began the moment a participant finished reading the instructions and started viewing the screenshots of Web sites and terminated the moment the participant hit the 'quit' button. The total number of words written to help identify the problematic areas of the Web sites was also counted as a degree of helping behavior. Measuring the total number of words ensured that we were measuring actual effort to help rather than time spent passively viewing Web sites.

Attitude. The same 10-item attitude scale from Experiment 1 was used. The reliability of these 10 items had a Cronbach's alpha value of .77 and were averaged to create a comprehensive measure of attitude toward colorblind people.

Results

Descriptive statistics of all dependent measures are given in Table 3, and detailed results of all regression tests are displayed in Table 4.

TABLE 3 Descriptive Statistics for Dependent Measures in Experiment 2 ($N = 97$)

		M	*SD*	Minimum	Maximum
Oneness	EE	3.98	1.84	.00	7.00
	PT	2.39	1.48	1.00	6.00
	Total	3.26	1.86	.00	7.00
Presence	EE	2.72	.86	1.00	4.40
	PT	1.46	.52	1.00	3.40
	Total	2.15	.96	1.00	4.40
Helping (time)	EE	91.34	226.55	.00	1411.78
	PT	79.48	152.65	.00	655.91
	Total	86.04	196.10	.00	1411.78
Helping (words)	EE	151.89	447.42	.00	2775.00
	PT	105.91	217.97	.00	1147.00
	Total	131.29	362.09	.00	2775.00
Attitude	EE	1.62	.78	−0.11	3.00
	PT	1.43	.91	−1.56	3.00
	Total	1.53	.84	−1.56	3.00

TABLE 4 Regression Analyses for Dependent Measures in Experiment 2 ($N = 97$)[a]

	Experimental condition	IRI	Condition × IRI
Oneness	.43**	.07	−.03
Helping (time)	.04	.11	.01
Helping (words)	.07	.04	.09
Attitude	.11	−.19	.31*

[a]Cell entries refer to the standardized regression coefficient.
*$p < .05$, **$p < .01$.

Manipulation check

An independent samples t test was conducted to compare means of the manipulation check scores between the EE and PT conditions. The Levene's test was significant and results were interpreted without assuming equal variances. The t test was significant, $t(80.02) = 19.05$, $p < .01$, $d = 4.01$, confirming the success of the manipulation of EE in delivering a vivid sensory experience of being colorblind. Participants who embodied the experience of being colorblind felt significantly more colorblind ($M = 4.15$, $SD = .91$) than participants who imagined being colorblind ($M = 1.26$, $SD = .46$).

Oneness

Next, a linear regression was conducted with oneness as the dependent variable and experimental conditions, IRI, and their interaction term as the predictors. Again, the experimental condition variable was dummy coded with 0 (PT) and 1 (EE), and IRI scores were centered. As shown in Table 4, results revealed that the main effect of experimental condition is significant, indicating that participants in the EE condition felt more at one with the colorblind person compared to participants in the PT condition. R^2 values revealed that experimental condition accounted for 18% of the model. IRI and the interaction term were not significant variables in the model. Therefore, Hypothesis 4 was not supported but the main effect of experimental condition is notable.

Presence–mediation analysis

Following the guidelines set out by Baron and Kenny (1986), a linear regression was conducted with experimental condition as the independent variable and oneness as the dependent variable, $\beta = .43$, $p < .01$. Next, a regression was conducted with experimental condition as the independent variable and presence as the dependent variable, $\beta = .66$, $p < .01$. Another regression was run with presence as the independent variable and oneness as the dependent variable, $\beta = .55$, $p < .01$. Finally, a linear regression with experimental condition as the independent variable and oneness as

the dependent variable, controlling for presence was run. Results indicated that presence ($\beta = .48$, $p < .01$) completely mediates the relationship between experimental condition and oneness ($\beta = .11$, $p > .05$). Therefore, Hypothesis 5 was supported.

Helping

A linear regression was conducted with helping time as the dependent variable and experimental conditions, IRI, and their interaction term as the predictors. None of the variables in the model were significant. Another linear regression was conducted with helping words as the dependent variable. Again, none of the variables in the model were significant. Therefore, Hypothesis 6 was not supported.

Attitude

Finally, another regression was conducted with attitude as the dependent variable and the same predictors as above. As shown in Table 4, the main effect of experimental condition had a positive but nonsignificant coefficient. The main effect of IRI had a negative but nonsignificant coefficient. The interaction term was significant, with the effect largely driven by participants with higher IRI, as shown in Figure 5. Adding the interaction term to the model significantly increased the R^2 value by 4%. Among participants with higher IRI, EE had lasting effects 24 hours following the experimental treatment leading to more favorable attitudes toward people with colorblindness than those of participants with lower IRI. Participants with higher IRI in the traditional PT condition demonstrated attitudes more negative than participants with lower IRI in the PT condition. Therefore, Hypothesis 7 was not supported.

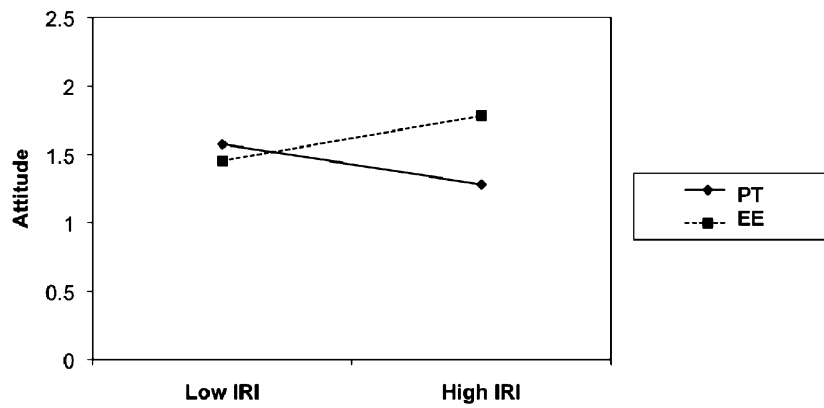

FIGURE 5 Interaction between experimental condition and IRI in predicting attitude toward people with colorblindness 24 hours after the experimental treatments.

Discussion

Experiment 2 built upon the results of the first experiment by shedding light on the mechanism of EE. First, it partially replicated the finding from the previous study that EE resulted in more oneness than PT. Moreover, the results demonstrated that presence mediated the relationship between experimental condition and oneness. In other words, the findings imply that participants in the EE condition perceived the experience of being colorblind to be more realistic than participants in the PT condition. As a result, these participants felt more merged with the colorblind person.

However, the moderating effect of IRI remains inconclusive in that everyone, regardless of their individual differences in IRI, felt higher self-other merging in the EE condition than in the PT condition. Also, the interaction between experimental condition and IRI was manifested in the direction opposite to our hypothesis in attitudes toward people with colorblindness—participants with higher, rather than lower, IRI drove the effect. Thus, although combined results of Experiments 1 and 2 imply that IRI moderates the effect of EE, the directions of the interaction are inconsistent, making it difficult to reach a conclusion.

The newly implemented helping measure failed to yield any significant results. However, when examining post experiment interviews, we were able to gain anecdotal evidence during the course of the experiment that the many experimental sessions were conducted later in the evening and at night when students often had prior engagements. Many participants expressed their regret in their inability to cancel these prior engagements despite their desire to help.

Despite some discrepancies, Experiment 2 fulfilled what we had set out to do by yielding insight into the underlying process of EE and finding out that EE leads to greater self-other merging than traditional PT through offering a more vivid and realistic experience of another person. However, because our ultimate interest in EE was whether it would encourage more actual helping behavior in the physical world than traditional PT, and because the attitudinal changes in the two earlier experiments were encouraging, a follow-up experiment was conducted specifically to test helping in the physical world.[3]

EXPERIMENT 3

To investigate whether EE could promote actual helping behavior outside of the virtual environment, Experiment 3 presented the improved helping task from Experiment 2 but also scheduled experimental time slots during the day when participants were less likely to have scheduling conflicts and would be able to volunteer their time. Situational variables such as scheduling

conflict are crucial barriers to manifested helping behavior as demonstrated in the seminal Good Samaritan study by Darley and Batson (1973), in which seminary students, who were ironically on their way to give a religious talk, failed to help an injured confederate. Therefore, the main purpose of Experiment 3 was to repeat the test of Hypothesis 6 from Experiment 2.

H6: EE will elicit greater helping behavior compared to traditional PT in participants with lower IRI.

As the moderating role of IRI was inconclusive from the earlier two experiments, Experiment 3 explored IRI as a moderator once again.

Method

Participants

A sample was recruited from two medium-sized schools. The sample ($N = 57$) consisted of 22 males and 35 females aged 18 to 56 ($M = 22.54$, $SD = 7.29$).

Apparatus

The same devices from Experiment 1 and 2 were used.

Design and procedure

Pretest. The IRI scale from Experiment 1 and 2 was used as a pretest. The 28 items had a Cronbach's alpha value of .74 and were averaged as a single IRI score. The IRI score ranged from 2.07 to 3.96 ($M = 3.03$, $SD = .40$).

Experiment. The same design from Experiment 1 and 2 pitting EE against PT was used, with the same-sex colorblind confederate photo used in Experiment 2.

The only procedural difference from Experiment 2 was that instead of completing the color-matching task on their own, they observed a video of the color-matching task being completed by someone else; that is, participants were told that in order to observe how a colorblind person would complete the task, the researchers had recorded a video of the colorblind person filling out a series of boards. The video stimulus was used in place of having participants move the haptic pen (as in Experiment 2) to control for the possible influence of interactivity on experimental treatments, as having participants interact with the virtual environment may lead to possible confounds. The participants were told that the video was a movie that captured the movements on the screen that the confederate made while filling out boards with the haptic device. The video was created so that it

would contain obvious mismatches, ostensibly committed by the colorblind confederate that they had been introduced to from a photograph. Participants donned a HMD and watched this video in stereoscopic view in either the colorblind perspective (EE) or in normal colors while imagining the confederate's perspective (PT).

Dependent measures

Manipulation check. The same two items (Pearson's r and p-value = .77) from Experiment 1 and 2 assessed how much the EE or PT treatment presented realistic experiences of being colorblind.

Helping. The same measure of helping time and words from Experiment 2 were used.

Results

Manipulation check

An independent samples t test was conducted to compare means of the manipulation check scores between the EE and PT conditions. The Levene's test was significant and results were interpreted without assuming equal variances. Results of the t test was significant, $t(38.61) = 6.54$, $p < .01$, $d = 1.71$, confirming the success of the manipulation of EE in delivering a vivid sensory experience of being colorblind. Participants who embodied the experience of being colorblind felt significantly more colorblind ($M = 3.25$, $SD = 1.34$) than participants who imagined being colorblind ($M = 1.52$, $SD = .53$).

Helping

Next, a linear regression was run with helping time as the dependent variable and experimental conditions, IRI, and their interaction term as the predictors. The same dummy coding (0 = PT; 1 = EE) was used and IRI scores were centered. Results revealed that the main effect of experimental condition is significant, $\beta = .27$, $p < .05$, indicating that participants in the EE condition ($M = 412.23$, $SD = 384.59$) spent significantly more time helping the colorblind person compared to participants in the PT condition ($M = 216.81$, $SD = 160.29$). R^2 values revealed that experimental condition accounted for 10% of the model. IRI and the interaction term were not significant variables in the model.

Another regression was run with helping words as the dependent variable. Again, results revealed that the main effect of experimental condition is significant, $\beta = .28$, $p < .05$, indicating that participants in the EE condition ($M = 149.13$, $SD = 141.25$) wrote significantly more words to help the colorblind person compared to participants in the PT condition ($M = 79.15$,

$SD = 62.33$). R^2 values revealed that experimental condition accounted for 9% of the model. IRI and the interaction term were not significant. Therefore, Hypothesis 6 was not supported. However, the main effects observed from both regressions are notable in that exposure to EE led participants to invest significant efforts in helping individuals inflicted with red-green colorblindness.

Discussion

Building upon the shortcomings of the first two experiments, Experiment 3 provided evidence of EE's ability to promote helping behavior in the physical world. Results indicated that participants in the EE condition invested approximately twice as much time and words to help colorblind people compared to the participants who relied solely on imagination. It is noteworthy that only a few minutes of exposure to EE triggered participants to spend twice as much time helping the general colorblind population (rather than the just the confederate) as participants who engaged in traditional PT. IRI did not moderate the effect of experimental treatments on helping behavior and its role as a moderator remains inconclusive.[4]

GENERAL DISCUSSION

Summary of Experiments

The current experiments explored the possibility of using IVET to allow individuals to embody vivid perceptual experiences and whether such experiences would encourage greater oneness, more favorable attitude toward people with colorblindness, and ultimately, helping behavior. Individual differences in feeling concern for others were measured and investigated as a moderating variable. Across the three experiments, there is evidence that IVET may be used as a tool to study perspective taking and promote helping.

Experiment 1 was an initial exploration of EE to test its effectiveness against PT and main findings demonstrated that the difference in the level of oneness and attitude elicited by experimental treatments (EE vs. PT) was greater for participants with lower IRI. EE was more effective for individuals with lower IRI: These people perceived greater oneness with the colorblind confederate and developed more positive attitude toward people with colorblindness that lasted up to 24 hours after the treatment. The difference between the effect of EE and PT on oneness and attitude was smaller for participants with higher IRI, for whom PT was more effective than EE. Our initial attempt at measuring helping by asking participants to help colorblind people train to overcome the disability backfired with people with lower

IRIs in the PT condition demonstrating more helping behavior than any other participants.

Experiment 2 was conducted to investigate the underlying mechanism of EE. Results indicated that participants in the EE condition found the treatment to be much more vivid and realistic compared to traditional PT. The increase in realism led to the increase in oneness. However, the measurement on attitude toward colorblind persons yielded results inconsistent with the first experiment in terms of the moderating role of IRI. This time, the difference in attitudes elicited by either EE or PT was greater for participants with higher IRI, for whom EE was more effective than PT. Also, a new helping measure was introduced with improved believability but no differences were found between conditions.

Experiment 3 was a final attempt at testing the ability of EE to promote helping behavior in the physical world. The helping task with improved believability from Experiment 2 was scheduled earlier on in the day so that participants would not have scheduling conflicts with their personal lives such as dinner appointments. Consequently, participants in the EE condition demonstrated twice as much helping behavior compared to participants in the PT condition. IRI did not moderate this effect.

Theoretical Implications

These results contribute to the field of communication and more specifically media psychology in largely three ways. First of all, the findings expand the Proteus Effect (Yee & Bailenson, 2007, 2009; Yee et al., 2009). In the original work, participants were asked to embody an avatar that differed in appearance with the participant in terms of height or attractiveness and found that participants behaved in ways that they believed people of such height or attractiveness would behave. The current experiments expanded on these results by allowing individuals to embody perceptual experiences. Another procedural difference from the Proteus Effect was that participants were explicitly instructed that they would be stepping into the shoes of another person, whereas participants in Yee and Bailenson's (2007, 2009) studies were told that the embodied avatar was the self. Consequently, the current experiments demonstrated that when participants embodied the perceptual experience of a colorblind person through the vivid sensory information provided via IVET, they felt similar to and spent time trying to help the colorblind person rather than simply acting like a colorblind person.

Second, Experiment 2 contributed to our understanding of EE by confirming that the perception of presence fully mediates the relationship between EE and oneness. The realism of the experience as measured by presence may well be a crucial factor of EE, particularly in the context of helping. Earlier studies (Cialdini et al., 1997; Maner et al., 2002) have evidenced the importance of perceived oneness with the target in eliciting

helping intentions; that is, these studies argued that people help based on selfish motivations and that people were only willing to help when they felt high oneness with the target (i.e., self is seen in the other when self-other merging occurs). Thus, the vivid sensory information provided in EE may have made the experience feel as if it were really happening to the self, leading to high perceptions of oneness. Based on the results of prior studies, higher perception of oneness may be what led to actual helping behavior in Experiment 3 and this relationship should be explored in future studies. These implications from Experiment 2 advance earlier work that explored the effects of embodying avatars and their experiences in immersive virtual environments (Ahn, 2011; Ahn & Bailenson, 2011; Fox, 2010) by yielding meaningful insights to the underlying mechanism of EE.

Finally, Experiment 3 expanded the findings of studies that deal with helping and altruism but stop at measuring self-reported intentions to help (e.g., Batson, 1997; Cialdini et al., 1997; Maner et al., 2002) and also studies that deal with virtual simulations (e.g. Jin, Ai, & Rasmussen, 2005; Kalyanaraman et al., 2010) by confirming that the effects of EE within the virtual environment can transfer into the physical world as actual helping behavior. The fact that participants in the EE condition, who were mostly undergraduate college students, spent an average of about 7 minutes alone (vs. 3.5 minutes in the PT condition), unsupervised, to help a complete stranger only after less than 5 minutes of exposure to EE is worth noting. This is even more so when these students clearly knew that they would not be compensated for their help and that they were free to leave whenever they wished.

There may be myriads of opportunities to practically apply EE to encourage favorable attitudes and helping behavior. The most representative application would be in diversity training in either educational or workplace contexts. For instance, a recent study demonstrated that diversity training with English speaking participants through traditional perspective taking and role-playing significantly increased favorable attitude toward non-English speaking individuals in a workplace scenario (Madera, Neal, & Dawson, 2011). Our findings imply that using EE in similar diversity training settings would amplify these positive attitudes. More importantly, the result of the diversity training through EE may be manifested as actual helping behavior toward members of different social groups.

Of course, the study is not without limitations. Helping, because it involves some extent of self-sacrifice, is difficult to demonstrate in laboratory settings when the participant has been introduced to a stranger in an unfamiliar location and situation. While it is meaningful that we were able to demonstrate actual helping behavior regardless of these restrictions, we can only conclude that EE encourages helping under qualified circumstances—when it is clear how the task will actually help the person in need and when the individual can spare the time. Although the helping tasks across all three experiments were designed to help the confederate and other

individuals sharing the same disability, the main difference in the helping tasks incorporated in the current experiments seems to be the degree of feasibility. The task in Experiment 1 claiming to help the confederate to learn how to differentiate colors may have seemed highly unfeasible whereas the task in Experiments 2 and 3 claiming to help the colorblind population by creating more accessible Web sites may have seemed more feasible. Indeed, earlier research showed that the confidence that the help-giver had with regard to successfully helping the individual in need moderated the amount of effort invested in helping (Oettingen, Stephens, Mayer, & Brinkmann, 2010). In Experiment 1, participants with lower IRI that were in the PT condition experienced less self-other merging and likely had greater unrealistic confidence of helping the confederate compared to participants who experienced greater self-other merging. This unrealistic confidence, in turn, may have elicited more helping and remains an interesting question for future research.

Also, the role of IRI as a moderator remains inconclusive. Although the effect of EE on people's attitude toward people with colorblindness seems to linger for up to 24 hours, the inconsistency in the moderating role of IRI makes it difficult to draw solid conclusions. Because the attitude measure was administered 24 hours following the experiment, there was little control over the participants during that time and situational variances that may have confound the results. Nevertheless, the fact that the effect of a few minutes of EE on attitudes toward individuals with disabilities was sustained for up to 24 hours is encouraging and merits further research.

Another limitation is the large standard deviations in the helping measure in Experiment 3. Because the measure of helping behavior is a ratio level of measurement with potentially large variability in the scale (i.e., participants could spend no time or as much time as they wanted to), the large standard deviation is almost inevitable. Despite the relatively small effect size in terms of R^2 change, no other study to the best of our knowledge has attempted to measure helping behavior in terms of actual time and effort spent. Considering the various factors that may have hindered helping behavior, such as the undergraduate population, a target who is a complete stranger, and no compensation for helping, our findings are meaningful in that we saw preliminary success in using EE to encourage actual helping behavior in the physical world, quantifiable in terms of the time and effort invested.

Conclusion and Future Directions

Based on these limitations, future studies should pay attention to both dispositional (e.g., IRI) and situational (e.g., EE or PT) variables and how they encourage interpersonal understanding and helping behavior. As the current experiments have provided a starting point for investigating the process of EE, future studies should probe boundary conditions from both the technical

aspect—amount of sensory information and its relationship to presence and oneness—as well as the situational aspect—whether some contexts induce more understanding and helping behavior than others.

With the advent of consumer technologies such as the Microsoft Kinect and Nintendo Wii, virtual environments of varying levels of immersiveness have become increasingly accessible. This means that people are able to enjoy the benefits of EE in their own livings rooms. Furthermore, technological advances in these consumer technologies are rapidly eliminating the need for relatively clunky devices such as the HMD and haptic device used for the current experiments, replacing them with motion sensing technology that allows users to control mediated contents with naturalistic gestures. This is meaningful as users are now able to enjoy virtual experiences without having to rely on costly equipment that restrict natural movement. The increased accessibility of hardware also implies an increase in accessibility of software, meaning that the content of EE may be tailored to the individual user.

In sum, the collection of three experiments compared EE against PT and investigated underlying mechanisms. More importantly, the current study makes a meaningful contribution as one of the few studies to demonstrate the increase of actual helping behavior through the use of IVET. With EE, the user is able to vividly, accurately, and realistically experience the sensations of another person and feel as if they have merged with that person. This sense of self-other merging in the virtual environment transfers to the physical world and translates into actual helping behavior, even when the other person is a complete stranger. In the words of a participant, "I did not realize how difficult it could be to do such an easy task [match colors]." These experiments demonstrate that too often, this realization seems to come only when you can see for yourself.

NOTES

1. Based on the participants' responses describing their thoughts on the EE or PT treatments, two coders were trained to code the thoughts for suspicion regarding the cover story (Cohen's $\kappa = .74$). Four participants demonstrated extremely high suspicion (e.g., "Is this person just another student looking at the 'colorblind' version of the board," "He's not really colorblind."). Data from these participants were removed from the final dataset.
2. Two of the male participants were much older than the student population—50 and 69 years old—but statistical analyses did not change after excluding them. Consequently. they were kept in the final dataset.
3. Chronologically, Experiment 3 was run before Experiment 2, but they are presented in reverse order in this article to enhance the comprehensibility and logic behind the experiments.
4. Sex of the participants was also tested as a moderator in an analysis of variance (ANOVA) to explore the effect of interactions between sex and experimental conditions on oneness, helping time, helping word, and attitude. None of the tests yielded significant results for the interaction and consequently, were not reported.

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