

Morality in Tele-immersive Environments

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ABSTRACT

Humans are spending an increasing amount of time in tele-immersive environments interacting with avatars or virtual human bodies. Additionally, human behavior and cognition are affected by experiences in tele-immersive environments. Although there is substantial psychological work surrounding the notion of morality, there is little work that examines the interplay of immersive digital environments and the moral identity of the digital medium user. We conducted a study to explore how participants' moral behaviors and self-ratings of morality changed after immersion in either a moral or immoral tele-immersive environment. Results revealed that participants who witnessed the immoral scenarios felt and acted more immoral than participants in the moral scenario condition. These findings have important implications for understanding the effects of digital media as well as for the study of the psychological construct of moral identity.

Keywords

Morality, moral psychology, tele-immersive environments, virtual reality.

1. INTRODUCTION

Millions of people are having meaningful social, economic, and medical interactions on a daily basis via avatars in online communities [28]. And just as the media effects research in the field of communication in the 1970's placed importance on studying the effects of television and other less-immersive forms of media, scholars today believe that the importance of understanding the effects of digital media is ever increasing [31].

Current media are far more immersive than they were over half a century ago. Today media design includes multi-view 3D video transport [26], real time dynamic 3D object shape reconstruction and high fidelity texture mapping [27], synthesized 3D sound [37], and advanced haptic hardware [21]. Such capabilities engage users' senses and cause them to feel more psychologically immersed in virtual environments [8]. Previous studies have shown that the effects of tele-immersive environments can extend into our physical realities. In a study by Bailenson, Bajcsy, and

colleagues [4], participants who learned Tai Chi movements in a tele-immersive environment by watching their 3D avatar from a third person perspective performed better in the physical world than participants who were only shown a 2D video recording of their movements. In addition, the characteristics of a user's avatar (such as physical attractiveness, height, levels of physical activity, or race) have effects on his/her thoughts and behaviors in virtual worlds and the physical world [17, 19, 35]. Such manipulations have been shown to change participants' thoughts and behaviors in a wide range of ways (from being more racially biased to more physically active), but little work has been conducted on how user morality may be affected by experiences in tele-immersive environments.

In the last 20 years, scholars in psychology have focused more attention on the area of moral psychology. Scholars have called attention to the social and cultural influences on moral psychology [20, 29] and have questioned how stable or malleable moral identity may be. Moral identity is defined as a commitment consistent with a sense of self to lines of action that promote or protect the welfare of others [9, 11, 22]. Although, moral identity may seem like a stable construct, it has been found to fluctuate with contexts and situations.

Tele-immersive environments' power to manipulate thought and behavior in the physical world, as well as moral identity's fluctuation in response to situational changes combined to form the main question in our study. Is one's personal sense of morality in the physical world altered by experiencing either moral or immoral scenarios in tele-immersive environments? We hypothesized that observing immoral versus moral scenarios in tele-immersive environments would distinctly affect users' behavior and feelings of morality in the physical world.

In this paper, we outline how other scholars have manipulated participants' moral behavior with simple situational manipulations. Next, we present findings from the media effects literature illustrating different theories on how media affect human thought and behavior and how tele-immersive environments fit into those theories. The design and results for the current study follow. Finally, we conclude with a discussion of the results and directions for future research.

2. MORAL PSYCHOLOGY

Recent studies in the area of moral psychology have shown that small manipulations can alter moral behavior and thought in subsequent tasks. For example, in two different studies Batson and colleagues demonstrated how simple contextual manipulations affect subjects' moral cognitions and behavior when it comes time to make moral judgments [6, 7].

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Other scholars have shown that the restoration or completion of the moral self can be achieved through direct restitution, but also through substitutable symbols or activities that are not directly related [32, 33]. In one study by Zhong and Liljenquist (2006) [36], subjects who were prompted to think about instances of immorality were more likely to take antiseptic wipes than subjects prompted to think about instances of morality. Zhong and Liljenquist deemed this the “Macbeth effect,” that is, a threat to one’s moral purity induces the need to cleanse oneself.

3. MEDIA EFFECTS

Media effects researchers have spent many years showing that when humans interact with media their thoughts and behaviors can be affected.

3.1 Modeling and Media Violence

Probably the most famous example of media modeling was the Bobo doll experiment [5], where children observed filmed violent acts and subsequently replicated them by physically abusing a doll. In support of the social learning theory, an overwhelming amount of research on violent and often immoral media (such as television, films, video games, and music) reveals that media violence increases the likelihood of violent behavior in both immediate and long-term physical world contexts [1, 2, 5, 10, 12].

3.2 Catharsis and Media Violence

The catharsis hypothesis opposes the media violence modeling theory. Scholars in this branch of research argue that viewing violence can be *cathartic* or that exposure to media violence permits angry or frustrated viewers to purge their feelings such that after viewing they are less likely to behave aggressively [13, 14, 15]. However, over time a great amount of support has come to bolster the modeling hypothesis [24].

3.3 Media and Prosocial Effects

Not all media effects research measures negative reactions to media; some studies track participants’ prosocial behavior in response to media [16, 18, 30]. Prosocial behavior is defined as behavior that is socially desirable and in some way benefits another person or society at large [30] – examples include generosity, cooperation, sympathy and others. In a meta-analysis, Hearold [23] found 190 tests for effects of prosocial behavior, and concluded that the relationship between prosocial television and prosocial behavior (.63) was stronger than the relationship between violent television and violent behavior (.30).

3.4 Tele-immersive Environment Effects

Recent work involving tele-immersive environments has confirmed that media effects which originate in tele-immersive environments can persist after users exit the tele-immersive environments. The same subjects were also more likely to engage in physical exercise in the days following their study session [17].

Another study explored how the race of a participant’s avatar affected participants’ scores on implicit association tests (IATs) measuring implicit racial bias. In a study by Groom and colleagues, an IAT was administered after each participant exited a tele-immersive environment where he/she was portrayed as either a Caucasian or non-Caucasian avatar. Participants in the

Caucasian condition were more likely to demonstrate a Caucasian bias than participants in the non-Caucasian condition [19].

In a study by Yee and colleagues [35], participants were given either a tall or short avatar and placed in a tele-immersive environment where they interacted with a confederate for about 15 minutes. Participants who were given taller avatars negotiated more aggressively in subsequent face-to-face interactions in the physical world than participants given short avatars. The effects of tele-immersive environments on participants’ real world behavior and thought span a wide spectrum and continue to garner scientific support.

4. CURRENT STUDY

The present study sought to quantify the power of moral and immoral tele-immersive environments on moral behavior and self ratings of morality in the physical world. In this study, all participants saw an avatar engaging in a behavior in a tele-immersive environment that was either moral or immoral. The authors predicted that viewing these morally provocative stimuli would change how participants viewed their moral identities. Specifically, based on previous findings by Zhong and Liljenquist [36], we predicted H1: participants who witnessed an immoral simulation in a tele-immersive environment would feel and act more immoral than participants who witnessed a moral simulation.

The study implemented multiple dependent variables to test how each subject’s morality changed in response to the stimuli. These dependent variables included the following: 1) a rating of how moral each subject considered himself or herself in regard to other students on campus; 2) a measurement of how often each subject reported engaging in specific moral and immoral behaviors; 3) Aquino and Reed’s [3] measurement of how important each subject rated his/her moral identity; 4) a behavioral measurement of how much time each subject would volunteer for an unpaid study (ranging from 0-60 minutes) as derived from Zhong and Liljenquist [36]; and 5) a measurement of how much waterless hand sanitizer each subject used after being immersed in virtual reality – again as derived from the Zhong and Liljenquist [36] study described above.

5. METHODS

5.1 Participants

Sixty-three university students participated in this study. Twenty-five males and 38 females participated in the experiment. Each participant was awarded \$5 or experimental credit towards fulfilling part of a class requirement.

5.2 Design

5.2.1 Independent Variables

Behavior was the between-subjects variable¹. Each participant saw an avatar doing something immoral or moral in virtual reality. In the *immoral* condition the participant saw the virtual human punch 60 approaching virtual humans (soldiers, adults, children, and elderly). After being punched each approaching person fell to the ground, and a pile of people collected over time. In the *moral* condition the participant saw the virtual human give first aid kits to 60 approaching avatars. After receiving the first

aid kit each virtual person exited the scene. All other aspects of the environment were held constant across conditions.

5.2.2 Dependent Variables

This list describes the variables in the order they were administered in the study. Waterless hand sanitizer served as the first dependent variable. After being removed from the virtual reality hardware, each subject was offered waterless hand sanitizer to clean his/her hands. This measurement was derived from Zhong and Liljenquist's moral cleansing studies [36]. In the current study, the research assistant recorded whether the subject chose to take hand sanitizer, as well as the number of pumps taken if applicable ($M = .59$, $SD = .56$, range: 0 - 2 pumps).

For the second dependent variable, each subject was asked to rate him/herself relative to other students at the same university on four items. The four items included: intelligence, creativity, morality, and outgoing personality. The questions were phrased as follows: "Compared to other students on campus, what percentage do you feel are less moral than you?" Subjects could respond between 0% and 100%, with a response of 100% signifying that they considered themselves one of the most moral students. The main item under consideration was morality, but the authors chose to present the morality item in the midst of other items to lower suspicion regarding the purpose of the study (Cronbach's $\alpha = .49$, $M = 62.92$, $SD = 15.67$, range: 20 - 90).

For the third dependent variable, subjects were administered a 13-item questionnaire developed by Wiltermuth, Monin, and Chow (2008) [34]. The questionnaire asked each subject to select with what frequency he/she had engaged in six moral and seven immoral behaviors. On the immoral side, these behaviors ranged from illegally downloading copyrighted material to faking sickness in order to avoid work. On the moral side the behaviors ranged from giving money to charity to helping a friend during a rough time. Participants could choose between the following five options for frequency: *never*, *rarely*, *sometimes*, *usually*, or *always*. A score for each subject was computed by adding the negative value of the immoral score to the value of the moral score ($M = 1.02$, $SD = .38$, range: .15 - 1.85).

Each subject was administered Aquino and Reed's self-importance of moral identity scale for the fourth dependent variable [3]. A score for each subject was computed by summing the internalization and symbolization components for each subject (Cronbach's $\alpha = .52$, $M = 53$, $SD = 8.22$, range: 26 - 67).

For the fifth and last dependent variable, subjects were asked if they would be willing to volunteer for an unpaid study. Subjects were told that if they decided to volunteer they would need to select between a 15-minute, 30-minute, or 60-minute slot. The number of minutes (ranging from 0 to 60) that each subject chose to volunteer was recorded. The subject was informed that the research assistant coordinating the volunteer study would contact him or her within the next few weeks to schedule the actual session ($M = 18.07$, $SD = 17.07$, range: 0 - 60).

5.3 Stimuli

The immoral simulation portrayed the virtual human punching 60 virtual humans who walked toward him/her. After being punched the virtual humans fell into a nearby pile. The pile of virtual bodies grew quite large over the course of the manipulation. The

stimulus was designed to grow more intense and immoral over time; therefore, the virtual human punched 20 male soldiers first, then a mix of 20 women and children, and finally a mix of 20 children and elderly individuals. The virtual simulation lasted approximately five minutes (see Figure 1).



Figure 1. Simulation of the immoral behavior. In the first scene the virtual human stands directly in front of the subject's view and waves. This scene allows the subject an opportunity to examine the virtual human's face in detail (1).

In the next shot, the virtual human is seen standing by a camouflage box on a street corner (2). Virtual human soldiers begin entering the screen from the right (3). Each soldier is punched and falls into a pile on the ground (4). Following the soldiers, women (5) and children (6) enter the scene to be punched. They also fall into the pile of people after being punched. Finally a mix of children and elderly (7) enter the scene. The virtual human punches 60 people in total. A large pile of people accumulates by the end of the simulation (8).

The second simulation portrayed the virtual human giving first-aid kits to 60 virtual humans who walked toward him/her. After receiving the first-aid kit each virtual human turned and walked past the virtual human actor until he/she disappeared off the screen. This virtual simulation was used in the moral condition. The moral stimulus was also designed to grow more intense over time; therefore, as in the immoral world, the virtual human actor gave first-aid kits to 20 soldiers first, followed by a mix of 20 women and children, and then a mix of 20 children and elderly individuals. The virtual simulation lasted approximately 5 minutes (see Figure 2).

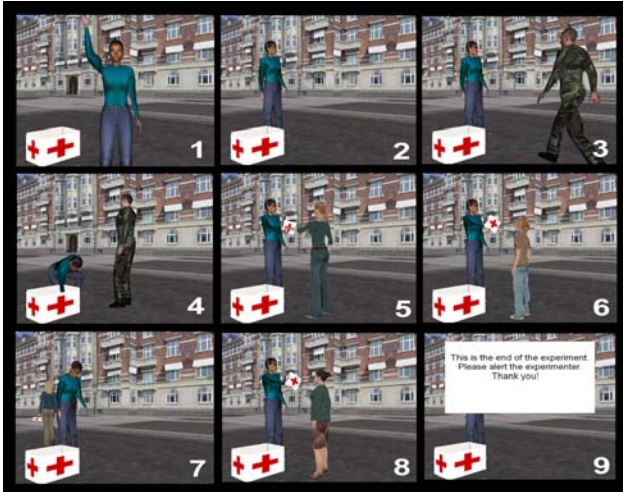


Figure 2. Simulation of the moral behavior. In the first scene the virtual human stands directly in front of the subject's view and waves. This scene allows the subject an opportunity to examine the virtual human's face in detail (1). In the next shot, the virtual human is seen standing by a big first aid box (2). Virtual human soldiers begin entering the screen from the right (3). Each soldier is given a first-aid kit and then turns to walk past the virtual human exiting the scene on the left (4). Following the soldiers, women (5) and children (6) enter the scene to receive first-aid kits. They also turn and exit the world on the left of the screen (7). Finally a mix of children and elderly (8) enter the scene. The virtual human gives first-aid kits to 60 people in total.

5.4 Apparatus

Each participant wore a Virtual Reality NVIS stereoscopic head-mounted display. The HMD featured a dual 680 horizontal by 480 vertical pixel resolution LCD. The display optics presented a visual field subtending approximately 50 degrees horizontally by 38 degrees vertically. Stereoscopic images were rendered by a 1700 MHz Pentium IV computer with an NVIDIA GeForce FX 5200 graphics card. For the moral/immoral behavior simulation, we set the viewpoint so that each subject would be forced to watch the immoral/moral behavior in its complete duration (i.e., the event was always in the subject's field of view regardless of head movements).

5.5 Procedure

When the participant arrived at the lab for the experiment session he/she was greeted by the researcher, informed about the basic format of the session and given a consent form and biographical questionnaire to complete. After the subject gave his/her consent, the researcher presented the cover story for the study. The researcher told the participant that the study was designed to explore how different individuals respond to different tele-immersive environments, and how real the different environments feel to different people. The researcher informed the subject that he/she would spend about 5 minutes in a tele-immersive environment watching a simulation.

The researcher asked each subject if he/she had any questions and then demonstrated how the head-mounted display (HMD) could be adjusted to the subject's head. The subject was then told that

the simulation would last approximately five minutes. The experimenter then started the simulation.

Afterwards, the subject removed the HMD and was given the pack of questionnaires (the relative rating of morality, Wiltermuth et al.'s self report of immoral/moral behavior items, the Aquino and Reed's self-importance of moral identity scale [3], and finally a probe for suspicion regarding the focus of the study). Immediately before the subject started filling out the questionnaires, the researcher sat a pump-bottle of waterless hand sanitizer in front of the subject and said, "Some people like to use hand sanitizer after being in the virtual reality equipment. You are free to use some if you'd like." A hidden camera was used to record the subject's sanitizer usage. After being offered the hand sanitizer each subject was left alone to complete the questionnaires.

At the very end of the experiment the subject was administered the volunteer dependent variable. The researcher explained that there was another graduate student in the lab conducting her thesis research, but that this researcher was not allowed to give credit or money to the participants who participated in her experiment. The researcher emphasized that the subject did not have to volunteer, but if he/she wanted to he/she would need to select time slot length: either 15, 30, or 60 minutes.

After the the subject responded to the volunteer request, he or she was debriefed, verbally questioned about suspicion regarding the purpose of the study, and then paid or granted credit and allowed to leave.

6. RESULTS

Two participants' data were dropped from analysis because they correctly guessed the focus of the study. The data from the remaining 61 subjects was used in analysis.

6.1 Hand Sanitizer

An independent samples *t*-test was conducted entering behavior (moral or immoral) as the between subject variable and number of pumps of hand sanitizer used as the dependent variable. A significant effect of behavior was found, $t(59) = 2.02$, $p = .05$, partial $\eta^2 = .07$. Subjects who witnessed the immoral behavior in the tele-immersive environment took more hand sanitizer ($M = .73$, $SD = .58$) than subjects who witnessed the moral behavior ($M = .45$, $SD = .51$). This finding supports H1.

6.2 Self Rating of Morality

An independent samples *t*-test was conducted entering behavior (moral or immoral) as the between subject variable and the subjects' relative morality scores as the dependent variable. A marginally significant effect of behavior was found, $t(58) = -1.89$, $p = .06$, partial $\eta^2 = .06$. Subjects who witnessed the immoral behavior in a tele-immersive environment were more likely to rate themselves as less moral in comparison to other university students ($M = 59.17$, $SD = 12.91$) than subjects who witnessed the moral behavior ($M = 66.67$, $SD = 17.44$).

6.3 Importance of Moral Identity

An independent samples *t*-test was conducted entering behavior (moral or immoral) as the between subject variable and the sum of the subjects' scores on the internalization and symbolization

components as the dependent variable. No significant difference was found ($t(59) = -.40, p = .69$, partial $\eta^2 < .01$) between the participants who witnessed the immoral behavior ($M = 52.57, SD = 6.64$) and the participants who witnessed the moral behavior ($M = 53.42, SD = 9.60$).

6.4 Immoral and Moral Behavior

An independent samples t -test was conducted entering behavior (moral or immoral) as the between subject variable and the sum of the subjects' scores on the immoral and moral behaviors questionnaire as the dependent variable. The greater the score, the greater the frequency of moral behaviors (and the lower the frequency of immoral behaviors) reported by the subject. No effect of behavior was found ($t(59) = -.38, p = .71$, partial $\eta^2 < .01$) between the participants who witnessed the immoral behavior ($M = 1.00, SD = .41$) and the participants who witnessed the moral behavior ($M = 1.04, SD = .36$).

6.5 Volunteering

An independent samples t -test was conducted entering behavior (moral or immoral) as the between subject variable and the number of minutes subjects' volunteered for another study (ranging from zero to sixty) as the dependent variable. No effect of behavior was found ($t(59) = -.59, p = .56$, partial $\eta^2 < .01$) between the participants who witnessed the immoral behavior ($M = 16.75, SD = 17.02$) and the participants who witnessed the moral behavior ($M = 19.35, SD = 17.30$).

7. DISCUSSION

The results of the current study demonstrate that experiences in tele-immersive environments can manipulate users' moral identities in the physical world. Participants who witnessed the immoral behavior in a tele-immersive environment were more likely to engage in physical cleansing and rate themselves as less moral compared to other students on campus when compared to the subjects who witnessed the moral behavior in a tele-immersive environment.

The immoral and moral behavior prompts in this study required noticeably less mental energy from the participant than in previous studies. In Zhong and Liljenquist's studies, participants were prompted to hand copy a short story that was moral or immoral or asked to actively recall personal behavior that was moral or immoral [36]. While both of these prompts led to significant self cleansing, they required physical or mental engagement from the participant. The moral and immoral tele-immersive environment prompts were more passive (requiring very little physical or mental energy from the participant) and still returned significant results. The ability to deliver great perceptual detail in an immersive environment may allow tele-immersive environments to easily achieve what other forms of media accomplish with more work, time, or human energy. For better or for worse, tele-immersive environments can alter our attitudes and behaviors.

8. FUTURE DIRECTIONS

Although these research results are interesting, we have not attempted to identify the mechanism that drives the change in participants' morality. Along with testing other morality-focused dependent variables, future studies should seek to explore and

hypothesize how tele-immersive environment experiences may manipulate real world morality.

In addition, researchers may want to study how viewing immoral or socially unacceptable behavior in tele-immersive environments might affect future tendencies for immoral or socially unacceptable behavior in the physical world [25].

Future work may also adopt other tele-immersive environment stimuli. For example, future simulations could be depicted from a first person point of view, so that the participant would see his/her virtual arms reaching out to punch or assist other virtual humans. Although increasing the amount of mental/physical involvement needed from participants, a tele-immersive environment simulation where participants move around in the virtual world and complete moral or immoral tasks may be extremely powerful.

Finally, the effect of tele-immersion on participants' behaviors and thoughts in physical reality may strengthen with more immersive environments. Adapting haptics, 3D sound, more detailed graphics, or tracking and rendering of the participant's viewpoint could magnify the effects seen in this study.

9. ACKNOWLEDGMENTS

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10. FOOTNOTE

¹ We also manipulated a second independent variable based on the appearance of the avatars. Half of the subjects witnessed an avatar that looked facially similar to them in the virtual world, the other half viewed dissimilar avatars. Given there was no difference between these two conditions on any of the dependent variables, this variable is not discussed further in the text.

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