Computer Based Video and Virtual Environments in the Study of the Role of Emotions in Moral Behavior

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Abstract. The role of emotions in moral issues is an important topic in philosophy and psychology. Recently, some psychologists have approached this issue by conducting online questionnaire-based studies. In this paper, we discuss the utility and plausibility of using computer based video and virtual environments to assist the study of moral judgments and behavior. In particular, we describe two studies: the first one demonstrates the use of computer generated visual effects. This was for the design and implementation of an experimental study aiming at observing participants' moral judgment towards an actor's confession of a behavior with doubtful morality, during which the actor either blushed or not. In the second study, we examine people's responses when confronted with a moral dilemma in a Virtual Environment.

Keywords: Moral Psychology, Virtual Reality, Emotions, Blushing, Moral Dilemmas

1 Introduction

For many years, emotions have been viewed as irrelevant or even an antagonistic factor when making moral judgments [1]: for example, members of jury are commonly reminded that they should not allow emotions to interfere in their judgment [2]. However, recently many moral psychologists and neuroscientists have viewed the role of emotion differently: they view the "quick, automatic affective reactions" that we have towards moral issues as part of our instinct, and that are shaped by natural selection [3, 4]. This theory proposed an obvious challenge to the traditional understanding behind moral psychology, and thereby led to a series of studies in which participants were invited to give their responses to moral dilemmas [3, 5]. The typical protocol of such studies includes a paper-based or internet-based questionnaire that consists of several moral dilemmas presented to participants for their judgment. The results of those studies have contributed to revealing the significant role emotion plays in moral judgment [3, 5]. In this paper we propose the exploitation of computer based videos and Virtual Environments (VEs) as an alternative approach to the study of moral issues, and present results from our studies to support this. The idea of using computer

generated graphics in psychological studies is not new, as it could "afford less of a tradeoff" between ecological validity and experimental control [6]. In this study, we further extend this type of research to situations associated with moral issues. In the following, we first review existing studies on the role of emotions in moral issues. Then we focus on one emotional expression: social blushing and its relation to moral emotions, where we demonstrate the use of computer based special effects in this area of research. In particular, we measure participants' moral judgment towards a video clip of someone making a confession of his actions when confronted with a moral dilemma, while giving the confession he was either blushing or not. Finally, we extended our studies to a VE in which we studied participants' reaction towards a moral dilemma *in vivo*.

2 Emotions and Rationality in Moral Judgments

There are two competing theories on the process of moral judgments: a traditional theory which holds that our moral behaviors are driven by conscious and rational reasoning [7], and a more recent theory that stresses the impact of human intuitions and emotions on our behavior [4]. Under the traditional theory (rational theory), morally matured individuals are capable of justifying their moral conduct with explicit principles. Following this theory, a trained philosophy student stands a better chance of providing more rigorous and precise moral reasoning than a randomly chosen member of the public. In such a process, emotion is something undesirable and thus should be avoided.

Possible reasons as to why emotions should be avoided while making moral judgments are summarized as follows [8]: emotions are partial (one would give more consideration to those they care more for, i.e., judging a harmful act as less serious if carried out by their sibling), arbitrary (favoring a stranger more than others because he wears the same shirt as someone you love), and passive (emotion is involuntary, therefore one cannot be held responsible for his emotional reaction. For instance, nobody would blame someone who just lost a close friend and therefore could not attend an important meeting). However, despite recognizing the irrational aspect of emotions, Pizarro argued that emotions could nevertheless aid reasoning as they "reflect our pre-existing concerns" [8].

Several experimental studies have provided evidence supporting the idea that emotion affects our judgment in decision-making, very often at an subconscious level: Bailenson et al. found that a voter is more likely to vote for candidates with their face manipulated to look similar to the voter's [9]; in a Dictator Game, participants who were informed of the family name of their counterparts gave a larger offer of money, as compared to those who had less information of their counterparts [10]. However, in that same study, the disclosure of family names had no significant effect in the Ultimatum Game. The authors proposed that in the Ultimatum Game, strategic considerations crowded out the empathy triggered by the family name. In this case, the rational side of brain processing outweighed the emotion reaction.

In the context of judgment with a higher moral weight, particularly in moral dilemmas that involve killing or saving people's lives, a similar pattern has been observed. Greene et al. [11] suggested that, depending on its content, different moral

dilemmas trigger different levels of emotional engagement. According to this theory, the result of moral judgments is a mixture of rational reasoning and emotional reactions, the proportion of the two varies systematically and could be related to how "personal" the moral dilemma is. Hauser et al. [5] proposed that the "moral attribution" of the action itself influences our moral judgments: even if pushing a switch and pushing a man down the bridge have the same consequences, the majority would find the former morally permissible but not the latter.

Questionnaire studies on moral dilemmas have provided insight on the role of emotions in moral judgment. In this type of study, moral dilemma scenarios are commonly presented as written descriptions. This method is certainly valid if moral judgment operates at a purely rational level. However, if moral judgment is a product from both rational reasoning and emotional intuition, there is a potential flaw: using purely written language, the emotional responses triggered by motor sensors are absent, causing the reader to compensate for this lack of information with their own personal experiences. As a consequence of this, the results from those studies reflect only what people imagine they would feel and do rather than how they would be feeling and what they would do *in vivo*. Moreover, using written scripts restricts the ability to convey certain sensory information that operates at a subconscious level. For instance, in the aforementioned experimental study by Bailenson et al. [9], if the scenario were to be presented with written language, it is unlikely anybody would choose to favor a candidate who is described to have higher similarity in their appearance to the voter. Visual stimuli therefore should be tested visually to reveal their power which happens only at a subconscious level.

However, scenarios involving moral dilemmas were to be presented in physical reality, irresolvable ethical problems would arise since most moral dilemmas involve saving or sacrificing people's lives. Here we propose an alternative approach: using virtual environments (VE) to create those moral dilemma scenarios, and generating visual stimulus that would otherwise be difficult to create in real life (e.g., blushing, which is involuntary). In the following sections we discuss two types of study: one uses computer special effect software to test the relationship between people's moral judgment and blushing; and a series of studies carried out in VE to test people's reaction towards a moral dilemma *in vivo*.

3 Moral Judgment and Blushing: A Pilot Study

3.1 Social Blushing and Morality

During an interpersonal communication, the most observed area of the human body is the face [12], which produces over twenty thousand facial expressions [13], and has been considered to be the channel to express emotions [14]. Among all facial features, blushing has been one of the most studied due to its mysterious nature: it is often considered to be undesirable, and psychologists have debated its function.

Due to its location and color, blushing is a directly observable signal indicating shame or embarrassment, and therefore might appease the observer [15, 16]. Leary and Meadows suggested that "blushing serves to placate others and restore normal relations after a transgression for which the person might otherwise be rejected" [17].

This is consistent with Semin and Manstead's finding that after performing a social transgression, people who displayed embarrassment received more positive evaluation than those who did not [18]. De Jong et al.'s work [19, 20] suggested that blushing serves a remedial function, such as attenuating the negative impression and therefore makes the observer judge the blusher's reason for blushing as less serious. His experimental studies have indicated that people who blushed after violating a social rule received less negative evaluation compared to those who did not blush. However, in this experiment only paper-based scripts were used where an embarrassing situation and the person's reaction to it were *described*. As a visual cue, blushing is very difficult to test under controlled experimental conditions because of its involuntary nature.

In this study we aim to investigate how blushing influenced people's moral judgment. Previously, we tested participants' reaction towards a blushing avatar that blushes after making a small mistake [21]. In this study, we tested their reaction towards something more serious than a small mistake – a moral behavior which could be interpreted as either permissible or not permissible.

During the interview in that previous experiment, many participants mentioned that the lack of facial expressions on the face of the avatar was disturbing, which impacted the effectiveness of blushing. In this new study we took a different approach: in order to achieve highly realistic facial expressions, we used direct recording of a professional actor's performance. Blushing was then added as a special effect. Here we present our experimental design, implementation, and finally discuss our results.

3.1 Experimental Design

Participants were invited to watch a video clip in which an actor told a story of a life-threatening situation that he survived a few years ago. Finally, he made a confession of an action that could be judged as not morally permissible. During the confession, the actor was either blushing or not, depending on the condition. After the presentation, participants were asked to complete a questionnaire regarding whether they found the actor's conduct morality permissible, as well as their judgment of the actor's personality.

The confession made by the actor was a fictitious story based on morality studies [22, 23], where the stories were presented on paper. Our aim was to choose a real "moral dilemma": something that on the average about half of the population would find morally permissible. The chosen script is as follows, a situation that amongst 38 participants, 58% found to be morally permissible in [23]:

"*Last summer I was on a cruise when a fire started. We were forced to abandon the ship and use the lifeboats. However, the lifeboats were not designed to carry that many people. The lifeboat I was in was sitting dangerously low in the water-a few inches lower and it would sink. The sea started to get rough, and the boat began to fill with water. If nothing was done, we would all sink before the rescue boats arrived and everyone on board would die. However, on our boat there was an injured person who would certainly die no matter what happened. I knew that if I pushed this person overboard we would stay afloat and the remaining passengers would be saved. To save myself and everyone else, I pushed this person out of the boat.*"

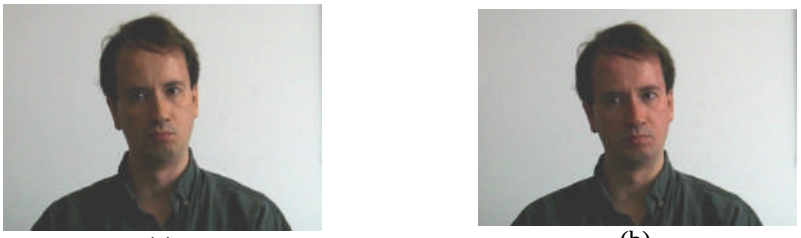
There were two conditions in the experiment, in condition one (blushing condition) the actor was manipulated to display blushing on his face during his confession. In the

condition two (non-blushing condition), the actor narrated his confession with a neutral facial color that remained unchanged throughout the whole video. Apart from the change of the facial color, the two video clips in both conditions are identical to each other. This was implemented by post-editing the facial color of the actor in the video clips. In the next Section, we present the implementation.

Our research questions were: (1) According to psychological studies, blushing serves as a remedial function. However, would the expression of blushing influence the participants' moral judgment towards the blusher? (2) Would blushing influence the participants' judgment of the blusher personality? (3) Would blushing trigger certain emotional response in its observer?

3.2 Implementation

We recorded the short movie with a professional actor, who studied the story in advance and narrated it in front of the camera while displaying a serious and sad expression on his face. Blushing is the reddening of the face, emphasizing the change of tone rather than the just the color of the face. Therefore we post-processed the original video clip with Adobe After Effect to prepare the two video clips used in the experiment. We first prepared the "non-blushing" video clip by adjusting the RGB value of the color on his face to a non blushing level and made it consistent for the whole video clip. Then we added color information abstracted from our "blushing reference" onto this "non-blushing" video to create our "blushing" video (Fig. 1).



(a) (b)

Fig. 1. (a) Non-blushing Video (b) Blushing Video

Our blushing reference was obtained by recording a short video clip of a person who was known to blush easily. She was informed about our research and agreed to participate. Blushing was induced by confronting her with the camera which was in itself sufficient to trigger embarrassment. In order to abstract color information, we analyzed the video frame by frame. As we were interested in finding how the recorded blusher's facial color changed, we selected a specific area of interest on her cheek and abstracted the color information of this area for each frame. We then applied the change of color from this reference video to the target video using Adobe After Effects frame by frame to create the effect of blushing. As mentioned above, we also produced a video that has a constant color value throughout the whole time, which was used in the non-blushing condition.

3.3 Results

We carried out a study with 24 participants, 12 in each condition (both 6 females and 6 males). The average age was 25 (±3.6 S.D.) years. The experiment was approved by the UCL Ethic Committee. Participants attended the experiment at pre-arranged times. Upon arriving, each participant was given an information sheet to read, and after they agreed to continue they were given a consent form to sign. They were then seated half a meter away from the display of a desktop machine running Windows XP. The experimenter then explained to them that their task was to watch a video clip, and then complete a questionnaire. They were also given a pair of headphones to listen to the video and a mouse to interact with the user-interface. The experimenter then left the participant alone in the room to watch the video. They then played the video clip, answered the questionnaire, and watched a final video clip in which the actor explained that the story was entirely fictional. Finally they went through a debriefing session and were paid 5 pounds for their time.

The post-questionnaire given to the participants consisted of questions regarding participants' judgments about the moral action (pushing a sick person off the boat to save other people) and their feelings towards the actor, and emotions they felt.

Our first concern was whether the display of blushing changed participants' moral judgments. The result showed that 67% of the participants found the action morally permissible, with 58% from the blushing condition and 75% from the non-blushing condition. The difference between the two proportions is not significant ($p = .68$, test of proportions), nor when compared with previous studies presented on paper (58%, 38 participants [23], $p = .48$). When considering the two genders separately, 67% females found it permissible (the same in both conditions), and 50% males found it permissible with the blushing actor, 87% with the non-blushing avatar.

Moreover, we were interested in how the blushing would influence participants' judgments towards the personality of the actor, including: *reliability*, *honesty*, *sympathetic*, and *likability*. We found no difference between two conditions when considering both genders together. However, when looking at two genders separately, we found that the blushing actor received higher rating scores on all four personality measures than the non-blushing one amongst female participants, whilst for male participants it was the opposite: the non-blushing avatar received higher scores on all four measurements. In particular, the blushing actor were judged as more reliable compared to the non-blushing actor ($p=0.04$, One-Way ANOVA) by female participants, and male participants found the non-blushing one more likable compared to the blushing actor ($p = 0.00$). The similar pattern of female participants gave more positive comments on the blushing avatar whilst male participants preferred the non-blushing avatar also applied on other questions: female participants thought the blushing actor's action as more appropriate, more obliged, less shameful, whereas for male participants, the above applied with the non-blushing actor. Our sample size is too small for meaningful statistical tests in comparison of gender by condition, but the results pointed to hypotheses for future research.

Finally, we also asked participants to choose from one of the six basic emotions (happy, sad, angry, surprise, disgust, fear) or nothing to describe their feelings. For male participants, it was almost the same in both conditions that half of them chose "nothing" and the other half chose "sad", apart from one participant who chose "sur-

prise" (blushing condition). For female participants, it was clear that blushing had an impact on their emotions: in the blushing condition, 2 chose "nothing", 2 "sad", and 2 "Angry". In the non-blushing condition, 2 chose "nothing", 2 chose "disgust", 1 "fear", and 1 "sad".

4 From Moral Judgment to Moral Actions

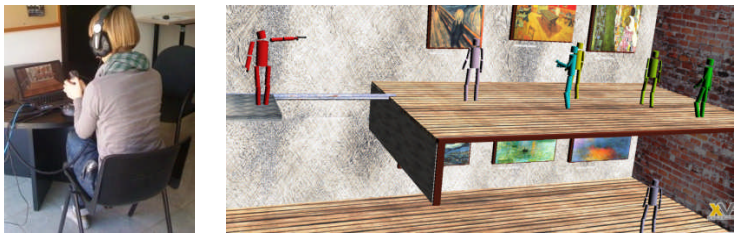
4.1 Moral Actions in VE

It has been frequently demonstrated that VE triggers people's realistic responses. In particular, in an immersive VE, people tend to respond to situations and events as if they were real, despite the fact that they are consciously aware of the situation's artificiality [24-26]. This attribution has made VE an ideal media for the studies of moral dilemmas, since we can recreate scenarios virtually and observe participants' feeling and behaviors *in vivo*. The moral dilemmas scenarios, as mentioned in Section 2, would be difficult to create in real life and certainly would generate great ethical concerns. In our lab we have conducted a series of studies using VE to create social encounters where participants were confronted with difficult choices in their actions. The power of VE has been demonstrated in triggering participants' realistic subjective, behavioral, and physiological responses [24, 25]. For instance, in Slater et al.'s Virtual Obedience experiment, participants were requested by an authority figure to inflict electric shocks on a virtual woman. Despite the fact that they knew the scenario was not real, 6 out of 23 participants (26%) withdrew early from the experiment and participants exhibited signs of stress albeit at a lower intensity than in the original studies by Stanley Milgram [27]. In another experiment, Rovira et al. explored participants' response to a violent event in VR [24]. In this experiment, Participants in a VE witnessed a perpetrator bullying a victim, leading eventually to violence. The results showed that participants became involved in the scenario and many intervened to try to stop the violence or said they wanted to intervene.

4.2 Would You Push the Switch to Save Five in VE?

More recently we conducted an experimental study examining social encounters directly related to moral dilemmas that involve sacrificing or saving people's lives [28], a scenario with a structure similar to that of the classic trolley dilemma used in moral studies. Here in order to achieve clarity (the consequences of participants' action has to be unmistakably understood) and originality (the scenario has to be new to all participants to achieve an unbiased effect), we designed a Virtual Art Gallery scenario in which a gunman started shooting while on a lift which was controlled by the participant. The situation was arranged such that participants were confronted with a moral dilemma: when the gunman started shooting they could either leave the lift where it was or send it down to the floor below. If they did nothing, 5 people would die; if they pushed the switch to bring the lift down, 5 people would be saved but one other person would instead be put in danger (the Action condition, Fig.2. (b)). There was another condition such that when the shooting occurred, if participants did nothing 1 would die but 5 would be saved (the Omission Condition). We have tested the scena-

rio in an Immersive VE (CAVE-like system) and a non-immersive desktop VE. Results from this first pilot showed that participants in the CAVE were more likely to give a utilitarian answer (saving the greatest number of lives) in the post experimental questionnaire. The result also indicated that, in both CAVE and desktop VE, participants' were shocked by the incident and many reported that they panicked and were under pressure in deciding what to do (this is more so for those who experienced the CAVE condition).



(a) (b)

Fig. 2. Moral Dilemma in Virtual Environment (a) Participants interact with the scenario through a Joystick (b) Gunman starts shooting at visitors in an art gallery (Action Condition)

In order to gain a better understanding of participants' panic reaction, we conducted a second pilot study that included the Autonomic Perception Questionnaire (APQ) [29] with the scenarios presented on a desktop machine. Here 10 participants attended our study (Fig.2 (a), 5 in the Action Condition, 5 Omission Condition). The APQ questionnaire was given to participants both before and after their experiment in order to observe their physiological changes caused by the scenario. The result suggested that in the Action Condition, the mean post-APQ score was higher than pre-APQ ($p<0.05$). In the Omission Condition, the post-APQ score was also higher than pre-APQ, but not significant ($p = 0.41$). Although the sample size was small, the result indicated that participants perceived increased physiological stress level, especially for those in the Action Condition, as shown in Fig. 3.

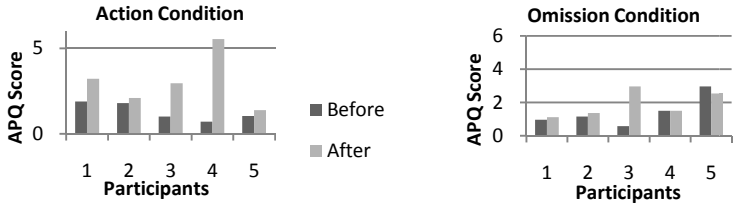


Fig.3. APQ Score from the Action and Omission Conditions

5 Discussion

In the first study presented in this paper, we assessed people's moral judgments towards an actor making a confession about his behavior when confronted with a moral dilemma. We also included an emotional reaction closely related to morality as an extra variable – social blushing. Our results suggested a very interesting pattern: fe-

male participants gave more positive judgments towards the blushing actor while male participants were more predisposed to positively evaluate the non-blushing actor. Although there was no evidence that blushing triggered a difference in participants' moral judgment directly, it was clear that blushing had an impact on participants' judgment on the actor's personality, and that blushing triggered different emotions in female participants. In our previous study, the result suggested that the blushing female avatar received more positive evaluations from male participants [21]; a more recent study which included female participants further supported our findings [30]. In our current work, when confronted with a dilemma with heavy moral weight, we have demonstrated that blushing on male triggered different reaction in different genders. However, it is yet to be explored whether such differences were caused by the gender of the blusher or the moral weight associated with the dilemma.

Secondly, we have reviewed a series of experiments conducted in our lab using VE related to moral issues, and described an on-going study investigating participants' reactions towards a moral dilemma *in vivo*. We presented results obtained from our second pilot study. The results suggested that participants had a significant increased level of perceived physiological stress in the Action Condition, which is more of a moral dilemma for the participants, as there was the urge for them to push the switch that would result in the likely shooting of one person who would otherwise be safe. However, the cause and effect is still not clear: is it because the situation makes them more stressed, and therefore they conducted the action (sacrifice 1 to save 5), or is it because they conducted the action, and therefore became more stressed? In future, more studies using VE will be conducted to further investigate this issue.

Both studies have further demonstrated the use of computer based video and Virtual Reality in triggering participants' realistic reaction at a subjective, physiological, and behavior level. Especially in the second study, although our VE set up only presented abstract human figures, participants had a strong reaction towards the moral dilemma as indicated by post experimental discussions with the participants. These two studies, together with previous research as reviewed in this paper, suggest that VEs can play an important part in investigating the role of emotions in moral judgment and behavior.

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