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The differential effects of agency on fear induction using a horror-themed video game

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ABSTRACT

Fear research faces a dilemma as typical methods of induction elicit passive or indirect fear, rather than authentic or direct fear. The present study investigated and compared the effects of interactivity, or agency, on the physiological responses of participants as measures of direct fear as they either played or watched a horror-themed video game. Assuming agency allows for greater immersion, the former group would exhibit greater physiological responses, possibly indicating greater fear reaction. Change scores were calculated from subtracting baseline mean values from exposure mean values for every participant in measures of electrodermal activity (EDA), respiratory rate (RR), and heart rate (HR). Self-reported fear data was also gathered for every participant. Players had a significantly greater increase than watchers in EDA, RR, and HR change scores. Players and watchers did not differ significantly in self-reported fear. Change score *t* tests for specific events that occur in the video game are also reported. These results suggest that the variable of agency may have had the effect of inducing a greater fear response and that it provides utility for researchers seeking to ethically induce direct fear.

1. Introduction

1.1. Direct and indirect fear

An obstacle for fear researchers to overcome is the elicitation of a direct fear response in subjects. Researchers sometimes rely on stimuli that induce shared fear. Empathic fear is either a fear for others, or a shared, social fear experience as explained by the work of Sanders, Mayford, & Jeste, 2013, who found that a shared experience compounds fear in mice. Shared fear is also known to exist by research showing that fear related facial expressions can serve as unconditioned stimulus (Esteves, Parra, Dimberg, & Öhman, 1994). The fear-learning through these types of observation is referred to as an indirect form of induction, contrasted with direct. Additionally, Olsson, Nearing, and Phelps (2007) reported evidence that empathy plays a role in fear-learning by observation. They found neural activation patterns in observational fear-learning. They found that the same areas in the brain that activate in reaction to direct fear stimuli also activate during indirect stimuli. However, they neither analyzed nor reported any differences in activation quality or intensity between the two conditions.

Olsson and Phelps (2007) elaborate by explaining that although direct and indirect fear may be activated by similar patterns, the indirect seem to involve a more distributed network of regions within the brain that are involved in social perception and evaluation. Finding a reliable method to induce direct fear would be beneficial in laboratory research. Doing so would allow more genuine responses in any given subject, while also upholding ethical guidelines.

1.2. Entertainment media as tools for fear induction

A contemporary and effective tool to induce fear is the use of entertainment media, namely film, video games, and virtual reality (VR). These media forms provide visual and auditory stimuli in high fidelity. That is, they can both mimic real life events and present unnaturally occurring ones that appear life-like. Horror-themed films are often used to induce fear, both in the laboratory and in mainstream entertainment (Vorderer, Wulff, & Friedrichsen, 2001). In horror-films, the audience views stimuli, mostly from a limited, third-person, omniscient point of view, and is prompted to experience fear for main and side characters alike. As for the use of horror-themed films in the laboratory, there are some interesting effects. Kreibig, Wilhelm, Roth, and Gross (2007) differentially compared fear- and sadness-inducing films along with neutral

emotion films. They were able to detect differences in all three by analyzing cardiovascular, electrodermal, and respiratory response patterns, which were bolstered by additional self-report data that also showed differences.

Still, the empathic fear that viewers of horror-films experience is passive and disconnected, thus resulting in an indirect fear response. A problem therefore exists for researchers who wish to observe fear responses. This is because the act of inducing direct fear response activates a specific reaction system shown to be not entirely similar to indirect fear responses. Two tools used by a wide range of emotion researchers and therapists that have the ability to elicit direct fear responses are VR and video games.

Used both in the lab, and in therapy, VR has become useful in detecting certain emotional responses including anxiety and fear. So quick has the use of VR become that O'Connor et al. (2014) write that they hope to bring about a revolution in 3D media and VR for interpersonal communication and interaction. Some examples of the use of VR in research are, first, Geslin, Bouchard, and Richir (2011), who compared gamers' to non-gamers' fear response using VR. Participants, whose past experiences with video games were assessed, were placed in a VR situation in which aversive visual and auditory stimuli were presented. Afterward, they completed an emotional response questionnaire Geslin et al. (2011). They found that subjects who considered themselves to be regular first-person-shooter gamers reported that they experienced less fear and surprise than those that considered themselves to be non-video gamers. In addition, the therapeutic use of VR has entered the area of exposure therapy and is found to be useful in desensitization procedures in which patients are exposed to life-like aversive stimuli (Malbos, Rapee, & Kavakli, 2013).

Video games may be the next best option for researchers if VR is unavailable for use. Both media forms can present stimuli in high fidelity, but they are different in two ways. First, VR's graphical presentation surrounds the field of vision, while in playing video games, the field of vision varies depending on the size of, and the participant's proximity to, a television set. The other is in how they are controlled. For example, standard in VR, gyroscopes incorporated into the machine allow the field of perception to change depending on the head's orientation, while video games have fallen on a standard controller set where two analog sticks, or a mouse and keyboard arrows are used to control movement. But one might ask what aspect is exactly the variable that induces fear using horror-themed VR and video games. Also, is the induced fear direct or indirect? In other words, are they different from watching a film?

1.3. Agency

One variable that is implicated in creating a heightened sense of fear in VR and video games is actually what makes the two similar. Either using a game controller or a gyroscopic headset, subjects have control of their virtual behavior. They have a means by which they can either manipulate the environment, or explore within it. Bordegoni's (2011) explanation of the action-perception model in Human—Computer Interfaces (HCI) is informative in this area. HCIs first begin with functional mathematical codes that lead to electronically produced acoustic, geometric, and sometimes haptic models. Movies contain sounds and shapes, but are without the ability to provide haptic models the way VR and video games can. Examples of haptic models include force feedback, and controller vibration. The subject can then react with their own haptic interface channel—the controller with its multiple buttons—affecting the functional mathematical code again, which continues the process of action and reaction between computer and person.

This principle of control is referred to in recent literature as agency. Agency is a sense of interactivity, autonomy, and presence that a player is said to feel as they make choices within a game's virtual world. Rigby and Ryan (2011) explain that agency allows players to be engaged and make stories their own. Perron (2009) theorizes that agency refers to a perceived causality between one's actions and the events in virtual environment. When it comes to horror-themed video games, players receive a sense of ownership over the actions carried out in the events of the game's narrative. Often found in video games are additional entities or figures that are also given signs of their own agency. In horror-themed games, these non-playable characters—perhaps once inanimate objects like lifeless bodies, dolls, or puppets, now displaying properties of life—are designed with artificial intelligence to appear to possess their own agency independent of the player's. Then, they will regularly act on, and threaten, the player's agency. This is thought to induce fear (Kirkland, 2009; Perron, 2009). Habel and Kooyman (2014) suggest to game designers that more research be done on video game interactivity and to utilize agency mechanics for future possibilities in horror-themed games as an effective feature for inducing fear.

In keeping with the more popular topic of video game research, Lin (2013) examined interactivity (agency) and its effect on players' aggression, rather than fear response. The design of her experiment was to manipulate agency and control for identification, which was surmised to be a mediating variable between agency and aggressive outcomes. She compared three groups: 1) those that played an aggressive character in a video game, 2) those who only watched the same character through screen-captured recording of the same game, and 3) those who watched a film that the video game was based on. The film and video game in question were X-Men Origins: Wolverine (both have the same title with the video game being the "uncaged edition"). When looking at the physiological responses of the participants, Lin found that blood pressure increased in those that played versus both the recording and film watchers. Heart rate was not found to increase, but Lin suggests it is because they only analyzed physiological states before and after playing, recording-watching, and film-watching, not during stimulation. In addition, the players experienced greater aggressive affect and cognition than the other two groups. Identification, where the player/watcher connects emotionally with the main character, was not seen to be a mediating variable in this scenario.

However, identification has been examined in tandem with agency in earlier studies. First, Peng (2008) refers to Social Cognitive Theory's (SCT) enactive and observational experience in his study on self-efficacy in learning, which may help describe possible effects of agency. SCT states that an individual learns both through interaction or passive observation (PO) within a real environment, and that the latter is more effective than the former. One key difference between the two is that observational experience may occur through mediated or non-mediated means (i.e., real or virtual environmental stimuli), while enactive experience may only be possible in the real world because that is where individual action can take place. Peng, however, theorizes that giving an individual control in virtual space, like a video game, should provide a *mediated* enactive experience (MEE). Through which, the user might perceive similar effects as a typical enactive experience, thereby providing greater potential for learning than PO. He writes that MEE will blur the line between the self and the manipulated virtual character, allowing for identification. Peng's experiment found MEE to be more effective in influencing self-efficacy than PO.

Second, Havranek, Langer, Cheetham, and Jäncke (2012) analyzed the sense of presence players felt by manipulating perspective and interactivity as measured by three standard questionnaires, electroencephalography, and standard low-resolution brain electromagnetic tomography. In their 2 (first-person perspective and third-person perspective) by 2 (agency and