THE PENNSYLVANIA STATE UNIVERSITY SCHREYER HONORS COLLEGE

DEPARTMENT OF PSYCHOLOGICAL AND SOCIAL SCIENCES

MISINFORMATION AND MEMORY: VIRTUAL REALITIES EFFECT ON THE MISINFORMATION EFFECT

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ABSTRACT

Eyewitness testimony is a key tool used in our justice system but how reliable is it? That has been the question surrounding research for decades. People's memories are susceptible to misinformation from outside sources (Loftus, Miller, & Burns, 1978) and this effect has been analyzed in many different contexts for more than thirty years. Traditionally the misinformation effect has been studied using two dimensional videos or photographs. New virtual reality technology has been creating more efficient ways to study real life situations in controlled laboratory environments and have been shown to be highly immersive. The current study analyzes the misinformation effect in a virtual reality setting in hopes of showing that an immersive environment will enhance the misinformation effect in a traditional research design. The current study utilizes the classic event of a car accident to test the misinformation effect. The use of virtual reality can also expand research about eye witness testimony in situations that may not be able to be efficiently replicated two dimensional models.

TABLE OF CONTENTS

LIST OF TABLES

ACKNOWLEDGEMENTS

Introduction

Memory is a complex process that involves both motivation and attention and is susceptible to several types of mistakes. For example, the formation of new memories, or the retrieval of prior ones, is highly vulnerable to suggestibility or other processes independent of the actual event. For instance, individual mood, such as being happy or angry, directly alters both retrieval and encoding (Bower & Cohen, 2014). People also tend to include newly acquired information from outside sources into their memories of a prior event (Schacter, 2001).

Similarly, the misinformation effect occurs when post-event information has an impact on a person's episodic memory (Loftus, Miller, & Burns, 1978). Seminal research on this effect showed that when participants watch a scene of a car accident and are then asked questions about their memories of the event, misleading information can impair a person's memory accuracy. Specifically, participants who were asked about the speed of two cars that "smashed" into each other responded with higher ratings than those who were asked about cars that "bumped" into each other (Loftus & Palmer, 1974). Since that early research, the misinformation effect has been studied numerous ways for more than 30 years.

For example, follow-up research shows there are certain characteristics that make a person more or less susceptible to the misinformation effect. Age influences the susceptibility to the misinformation effect. Young children and elderly individuals tend to be more susceptible than older children or average age adults (Cici & Bruck, 1993; Davis & Loftus, 2005). Personality also impacts susceptibility. Participants with higher general anxiety perform poorly on eyewitness testimony tasks (Loftus & Siegel, 1978). Likewise, participants who scored low

on extraversion scales were more susceptible to false memories (Porter, Bellhouse, McDougall, Brinkle, & Wilson, 2010).

The misinformation effect has been studied for decades using research traditionally conducted in a laboratory setting. Participants witness an event on a two-dimensional screen, through either sequential photographs or a video simulation and are asked to imagine being in that location or experiencing those events. While this methodology has aided substantial research, we now have technology that can enhance the participants' feelings and perceptions of being in a real-life event, thus enhancing the external validity of the data gathered.

Virtual Reality is an artificial environment that is experienced through sensory stimuli provided by a computer and in which one's actions partially determine what happens in the environment (Merriam-Webster, 2011). Such immersive technology is being used in the field of psychology more and more for clinical treatments and research. For example, virtual reality has been used in exposure therapy for patients who suffer from phobias (Parsons & Rizzo, 2008) and virtual reality treatments have the potential to be effective in treating patients with PTSD (Goncalves, Pedrozo, Coutinho, Fiqueira & Ventura, 2012). Participants in virtual reality environments have reported a strong immersive presence while in the environment although isolation from the outside world and time spent in the environment influence the degree of presence (Schuemie, Van Der Straaten, Krijn & Van Der Mast, 2001).

The Present Study

The purpose of this study is to use virtual reality technology to expand the research about the misinformation effect by immersing the participant in a 3-D world. The misinformation effect is a trend all humans are susceptible to, some more than others. Current research has not utilized an immersive environment, which provides a more robust test of real world settings.

Therefore, it was hypothesized virtual reality will enhance the misinformation effect in contexts previously shown and provide a pathway for future simulations of eyewitness testimony that were not able to be effectively modeled or simulated in two dimensional paradigms. Unique moderating variables, including individual trust of others will also be tested.

Method

Participants

A sample of 97 undergraduates participating in an introductory psychology research participant pool were recruited for this study (39 males, 57 females, and 1 who identified as other). 22.7% of the students were Caucasian, 6.2% African American, 47.4% Asian/Pacific Islander, 16.5% Hispanic/Latino, 4.1% Native American, 3.1% of students identified as other. 94.8% of participants were 18-24 years old.

Materials & Measures

Yamagishi General Trust Scale (Yamagishi, T. & Yamagishi, M. ,1994). This scale measures participants' views about honesty and trustworthiness in others. This scale is a six-item scale in which participants' rate statements about trust and honesty such as "Most people are basically honest." Participants are required to rate each statement on how much they agree with the statements on a five-point scale (1=strongly disagree to 5=strongly agree).

McCroskey's Introversion Scale (Richmond, & McCroskey, 1998). An 18-item scale that includes items drawn from Eysenck. Questions assess feelings about social interactions and mood. Alpha reliability averages have been over .80. The scale includes items about neuroticism but they are used as fillers and not scored with introversion items. Participants are required to score statements based on how much the statements apply to them on a five-point scale (1=strongly disagree to 5=strongly agree).

The Penn State Worry Questionnaire (PSWQ, Meyer, Miller, Metzger & Borkovec, 1990). This questionnaire assesses how much a person worries. Worry is a distinct feature of generalized anxiety. The questionnaire is a 15-item scale that includes statements such as "I do not tend to worry about things" and "Many situations make me worry." Participants are required to rate each statement on a five-point scale (1=not at all typical of me to 5=very typical of me). Positively worded statements are scored in reverse (eg. If a participant rates a positively worded statement 5 the statement will receive a score of 1).

Participants will be immersed into a 3-D environment using Oculus Rift Virtual Reality Headsets. The environment will be an urban city. The participants will be exposed to a four-block radius of the city. Participants will be on a set path for approximately three blocks up until the car accident. After the collision, participants will be able to interact with a one-block radius that includes two damaged vehicles and people standing around the scene. Participants may also be able to interact with various avatars via text, depending on condition.

Procedure

Participants will be recruited from an introductory psychology research participant pool. After arriving at the appointed day and time, participants will be given a consent form outlining the task in the virtual environment and the questionnaires. The consent form will also include the assurance that no identifying information will be collected and a contact number if the participants' have any questions or concerns.

After providing consent, participants will first complete short survey using MediaLab data collection software. That survey will include the following measures, in order: Penn State Worry Questionnaire, McCroskey's Introversion Scale, and Yamigasi's Trust Scale. Participants will also be asked various demographic questions such as sex, age, and race.

Upon completing the introductory survey, participants are then instructed to approach the researcher for the next task. They are then fitted with the Oculus Rift headset and placed into the virtual environment in a single person laboratory room.

All participants will be exposed to an urban city environment where they will begin walking on a set path of a four-block radius. All participants will then be exposed to a scene that includes two wrecked cars and people standing around the damaged vehicles. All participants will be able to explore the scene from any angle they want.

Participants in condition 2 and three will be able to interact with two people at the scene via text. In condition 2 participants will receive the following information: "The black car bumped the blue car." and "The black car was texting!" In condition 3 participants will receive the following information: "The black car smashed the blue car" and "The blue car was texting!" Participants in condition one will not be able to interact with people in the scene and therefore will not receive any information.

After the participant feels they have had enough time to adequately explore the scene and/or talk to witnesses, they will then be asked questions about their memories and perceptions of the scene using MediaLab data collection software. The questions include the speed of the cars at impact, the presence of broken glass, and which car was at fault.

Results

A manipulation check was included in analysis. 33.3 percent of participants did not pass the check. Their data was excluded from the results. Despite this bringing down the sample size to 62 (N=62) we felt excluding participants who did not pass the manipulation check made the data more relatable.

It was originally hypothesized that virtual reality will enhance the misinformation effect in contexts previously shown. In the classical study of the misinformation effect participants memories were analyzed by three variables; perceptions of the speed of the vehicles, presence of broken glass at the scene, and who caused the accident. Chi-square test of independence and independent t-tests were performed to examine the relation between these three variables and condition. Based on these results, misinformation did not affect how participants answered these memory questions except for one, speed [$F(2.92, 24.064)=3.58, p=0.034$].

When asked to estimate the speed of the vehicles the avaerge speed changed depending on what misinformation the particpaint was exposed too. Higher speed were reported by partipaints in conditon 3 where they received information containing the word "smashed" (see table 1).

Table 1 *Average reported speed of vehicles across three conditions*
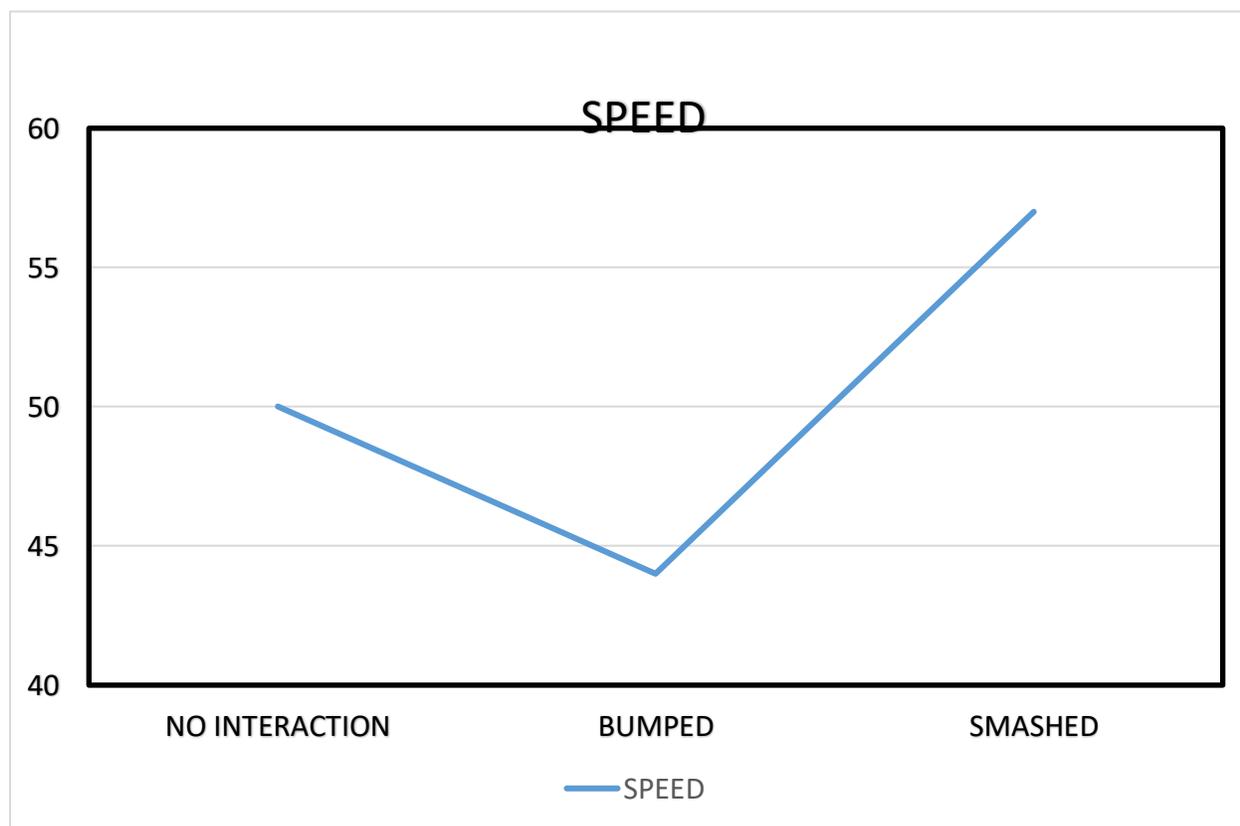
A chi-square test of independence was performed to examine the relation between condition 2 and 3 and reports of who caused the accident. The relation between these variables was not significant, X^2 (2, N = 42) = 5.918, p=0.052. Although there was no significance the trend did appear such that reports of the blue car causing the accident were higher for participants in condition 3 where the blue car was mentioned in the post event information (30%) than in condition 2 where the black car was mentioned (4.5 %) (see table 2).

Table 2 Perceptions of cause of accident across conditions
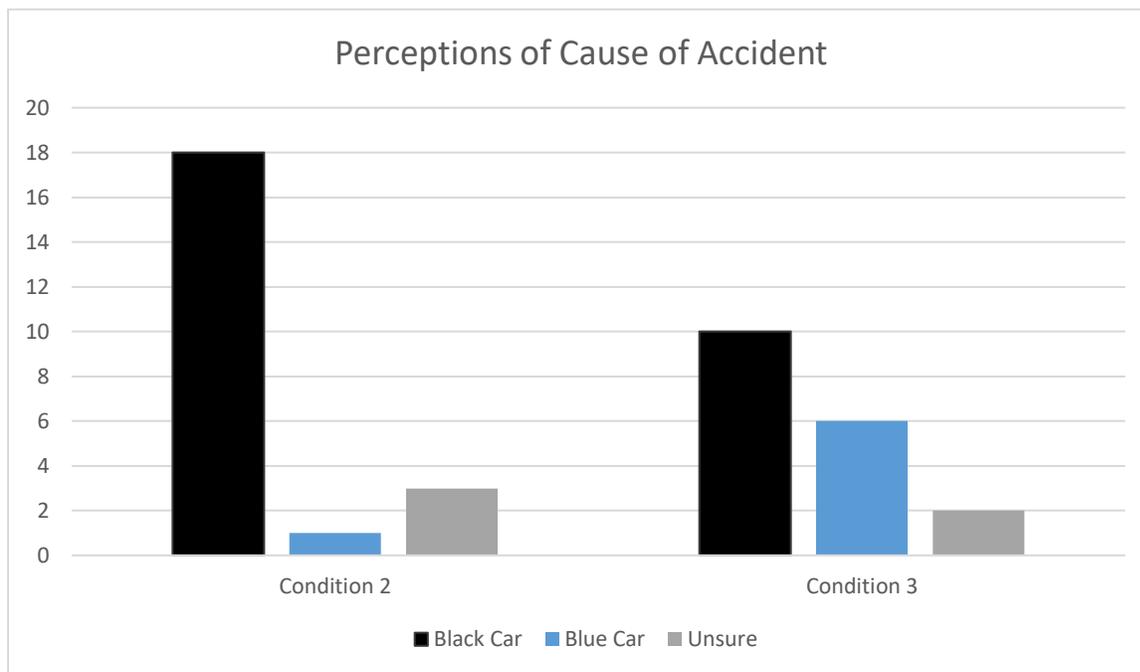
Two-way anovas were also preformed to analyze three personality scales effect on how susceptible the participant was to misinformation using speed as a variable. It was hypothesized introversion, high anxiety rates and rates of distrust would make a participant more susceptible to misinformation. No significance was found.

Discussion

The main hypothesis that The Misinformation Effect would be enhanced using a virtual reality environment was not supported. In the classical study (Loftus, Miller, & Burns, 1978) it was shown that appearance of broken glass, speed and perceptions of cause were both influenced by post event information. In the current study only speed significantly matched this trend.

Although there was no significance in the other two factors the trends did appear and perhaps with a larger sample we would find significance. There was also no significant effect on susceptibility to misinformation based on personality traits such as introversion, anxiety, and distrust. This may too be due to the sample size.

Limitations and Future Directions

One limitation of this study method includes using a sample that is focused on college age students even though people of all ages can be eyewitnesses. Research has shown age is a factor in the level of susceptibility to the misinformation effect. A more diverse age population may yield different results.

Another limitation of this study is the sample size. Even the original size (N=97) was quite small. When cut down by manipulation checks it was difficult to find significance across such a small sample (N=62). Based on the trends of the results I would hypothesis significance would be found if replicated with a larger sample.

For future directions, this study should be replicated with a larger more diverse sample. I still believe virtual reality can enhance the research about the misinformation effect. Virtual reality can play a huge role in studying the misinformation effecting in ways not before possible.

The misinformation effect should be studied in high emotional situations to evoke a real eye witness may experience that may influence their memory of the event.

Conclusion

In this current study we set out to enhance the misinformation effect by using virtual reality. In this study we did not find significance between participants'' recollection of the car accident and information except when it came to speed. Eyewitness testimony plays a crucial role in identifying and prosecuting suspects in our criminal justice system. Thus, research of the misinformation effect can inform investigators on the best strategies for asking question about events and aid prosecutors, judges, or jurors in understanding the relative weight that should be assigned to eyewitness testimony. Using virtual reality can present a wider range of possibilities that the misinformation effect can be studied in and therefore should be pursued more in depth.

References

Bower, G. H., & Cohen, P. R. (2014). Emotional influences in memory and thinking: Data and theory. *Affect and cognition*, 291-331.

Ceci, S. J., & Bruck, M. (1993). Suggestibility of the child witness: A historical review and synthesis. *Psychological bulletin*, *113*(3), 403.

Davis, D. and Loftus, E.F. 2005. Age and functioning in the legal system: Perception memory and judgment in victims, witnesses and jurors. In *Handbook of Forensic Human Factors and Ergonomics* Taylor and Francis, London.

Gonçalves, R., Pedrozo, A. L., Coutinho, E. S. F., Figueira, I., & Ventura, P. (2012). Efficacy of virtual reality exposure therapy in the treatment of PTSD: a systematic review. *PloS one*, *7*(12), e48469.

Loftus, E. F., Miller, D. G., & Burns, H. J. (1978). Semantic integration of verbal information into a visual memory. *Journal of experimental psychology: Human learning and memory*, *4*(1), 19.

Loftus, E. F., & Palmer, J. C. (1974). Reconstruction of automobile destruction: An example of the interaction between language and memory. *Journal of verbal learning and verbal behavior*, *13*(5), 585-589.

Meyer, T. J., Miller, M. L., Metzger, R. L., & Borkovec, T. D. (1990). Development and validation of the penn state worry questionnaire. *Behavior research and therapy*, *28*(6), 487-495.

Parsons, T. D., & Rizzo, A. A. (2008). Affective outcomes of virtual reality exposure therapy for
anxiety and specific phobias: A meta-analysis. *Journal of behavior therapy and
experimental psychiatry*, *39*(3), 250-261.

Porter, S., Bellhouse, S., McDougall, A., Ten Brinke, L., & Wilson, K. (2010). A prospective
investigation of the vulnerability of memory for positive and negative emotional scenes
to the misinformation effect. *Canadian Journal of Behavioral Science*, *42*(1), 55.

Richmond, V. P., & McCroskey, J. C. (1998). Introversion scale. *Communication apprehension,
avoidance and effectiveness* (5th Ed.). Boston: Allyn & Bacon.

Schuemie, M. J., Van Der Straaten, P., Krijn, M., & Van Der Mast, C. A. (2001). Research on
presence in virtual reality: A survey. *Cyberpsychology & Behavior*, *4*(2), 183-201.

Siegel, J. M., & Loftus, E. F. (1978). Impact of anxiety and life stress upon eyewitness
testimony. *Bulletin of the Psychonomic Society*, *12*(6), 479-480.

Schacter, D. L. (2001). *The seven sins of memory: How the mind forgets and remembers*. New
York, NY: Houghton Mifflin Company.

Yamagishi, T. (1986). The provisioning of a sanctioning system as a public good. *Journal of
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