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Emotional Bond between the Creator and the Avatar: Changes in Behavioral Intentions to Engage in Alcohol-Related Traffic Risk Behaviors

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EMOTIONAL BOND BETWEEN THE CREATOR AND THE AVATAR: CHANGES
IN BEHAVIORAL INTENTIONS TO ENGAGE IN ALCOHOL-RELATED TRAFFIC
RISK BEHAVIORS

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DEDICATION

I dedicate this dissertation to my wonderful family, especially to my supportive and thoughtful parents who have shown me many ways to enjoy challenges and overcome difficulties, and to my irresistibly warm sisters and brother who traveled thousand miles only to see me. I must also thank my precious nephews who make our lives like heaven on earth. Finally, I dedicate this work to my grandmother who watches us in a peaceful place. Her pray and encouragement make me to appreciate the values of learning and continue the pursuit of academic excellence.

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ABSTRACT

The present study examines the joint impact of relationship with one's avatar and negative consequences to the avatar on changing behavioral intentions (CBI) in terms of alcohol-impaired driving. Avatars are users' visual self-representation in a virtual world, and play a major role to build the users' digital identity. One hundred eleven participants volunteered to participate in several experimental conditions where the degree of choice of avatar features and the degree of active control of the avatar were manipulated in Second Life, an immersive 3D virtual environment. Participants who were allowed to customize their avatar viewed their avatar more similar and emotionally close to themselves and more physically attractive than those who were assigned a basic avatar. Participants in the choice and control condition were more likely to change BI positively when they identified their avatar as similar to themselves and viewed their avatar as more attractive. After observing the car accident due to an intoxicated driver, in the choice and control condition, participants' higher alcohol consumption and negative driving experience while intoxicated were positively associated with the degree of relationship with their avatar, and influenced participants' willingness to change BI positively. Participants who were allowed to control their avatar were more likely to attribute the responsibility of the car crash to themselves than those who observed someone else's avatar playing. Participants who felt distressed about the car crash also blamed their avatar and themselves for the accident. Implications for the use of virtual reality games in promoting healthy behaviors are discussed in detail.

TABLE OF CONTENTS

DEDICATION	iii
ACKNOWLEDGEMENTS	iv
ABSTRACT	v
LIST OF TABLES	viii
LIST OF FIGURES	ix
CHAPTER 1: INTRODUCTION	1
1.1 Binge drinking and alcohol-impaired driving on American college campuses	5
1.2 Education and prevention programs and the issue of effectiveness	7
CHAPTER 2: CONCEPTUAL AND THEORETICAL BACKGROUNDS	14
2.1 Identification theory within developmental-social psychology	16
2.2 Key factors of identification development and relationship with avatar	19
2.3 Importance of avatar's attractiveness and relationship with avatar	23
2.4 Relationship with avatar and its impact on changing behavior intentions.....	25
2.5 Attribution of responsibility for the crash and relationship with avatar	38
CHAPTER 3: METHOD	43
3.1 Overview of the experimental design in session 1.....	43
3.2 Overview of the experimental design in session 2.....	48
3.3 Participants.....	51
3.4 Procedure	53
3.5 Measurement.....	56

CHAPTER 4: RESULTS	64
4.1 Manipulation check.....	64
4.2 Validation checks.....	64
4.3 Preliminary analysis.....	67
4.4 Hypothesis tests	68
4.5 Further analysis	85
CHAPTER 5: DISCUSSION	88
5.1 Limitations and implications for future research	98
5.2 Implications of the study.....	102
REFERENCES	108
APPENDIX A: INFORMED CONSENT	118
APPENDIX B: DEBRIEFING FORM	120
APPENDIX C: QUESTIONNAIRE OF SESSION1	121
APPENDIX D: QUESTIONNAIRE OF SESSION2	128

LIST OF TABLES

Table 4.1 Factor structure of the relationship between the avatar and the creator at T1 ..	68
Table 4.2 Correlations between the degree of relationship with avatar and CBI	75
Table 4.3 Correlations between alcohol-related variables and CBI.....	77
Table 4.4 Correlations between alcohol-related variables and the degree of relationship with avatar in choice and control condition	79
Table 4.5 Correlations between alcohol-related variables and the degree of relationship with avatar in choice-only condition	80
Table 4.6 Correlations between alcohol-related variables and the degree of relationship with avatar in control-only condition	81
Table 4.7 Correlations between the degree of relationship with avatar and attributional processes.....	85
Table 4.8 Correlations between the degree of relationships with avatar and ERC.....	86
Table 4.9 Correlations between ERC and attributional processes	87

LIST OF FIGURES

Figure 2.1 A process model of relationship development with avatar and its impact on behavioral intentions and attribution	16
Figure 3.1 Screen snapshots of the processess of customixing an avatar in SL	44
Figure 3.2 Screen snapshots of the lists of possible activities in SL	45
Figure 3.3 Examples of customized avatars in the choice and control condition	46
Figure 3.4 Twelve different types of basic, completed avatars for beginners in SL	47
Figure 3.5 Screen snapshots of avatars dancing and drinking beer at the club in SL.....	49
Figure 3.6 Screen snapshots describing the process of how the driver was chosen at T2	50
Figure 3.7 Screen snapshots of the procedures of an accident at T2 in a video clip	52
Figure 3.8 Diagram of the flow of procedures and measures	53
Figure 3.9 Screen snapshot of one slide of Internet-based questionnaire measured at T1	55

CHAPTER 1

INTRODUCTION

This dissertation research examines the degree of emotional bonding with one's virtual character when a person has different levels of interaction with the character, called an *avatar*. In general, avatars are users' visual self-representations in an online world. Users can choose one of the avatars, as a complete form in a 2-Dimensional environment or they have an option to create personalized avatars by customizing several avatar-related items, such as body figures, skin tones, hair styles, clothes, accessories in a 3D environment. Avatars provide personal information about controllers before a conversation and an interaction between users starts. Avatars play the users' digital identity and the users build the different degree of relationship with their avatars.

Then, the study looks at the impact of negative consequences to the avatar on changing the person's behavioral intentions with respect to driving under the influence of alcohol. Alcohol-impaired driving causes serious damages, and it is important to investigate the potential of using avatar-based virtual environments (VEs) in changing health-related behavioral intentions. This study reasons that watching an alcohol-impaired avatar have a serious car-wreck may lead to a change in the behavior of the person who controls the avatar to the degree that the controller is emotionally attached to the avatar and considers that their avatar closely resembles themselves. This study uses a series of experimental procedures to create varying degrees of relationship with one's avatar in Second Life (SL) where the most advanced 3-dimensional avatar technologies

are adopted and a giant social world is constructed by SL users. After varying degrees of relationship with avatar are established, all participants' avatars engaged in a "hard partying" section. Participating avatars drink diverse alcoholic beverages, dance and get socialized with others. After the enjoyable alcohol-related party, all participants experience negative consequences of excessive alcohol consumption and driving. They watch an individualized video clip showing a motor vehicle crash caused by their avatar (seeing someone else's vehicle on fire with serious injury to the passengers, who need emergency medical treatment). Then, the degree to which these experiences affect the relevant behavioral intentions and the degree of feeling responsible for the accident are examined.

This study has two primary contributions. Even though alcohol consumption is not legal in most states for youths under 21 years of age, binge alcohol consumption is a wide-spread problem on American college campuses and it has a number of detrimental consequences (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2008). Among these are vehicular accidental injuries, accidents of other sorts, fights, rape and sexual assault, poor academic performances, alcohol abuse and dependence (Beck, Kasperski, Calderia, Vincent, O'Grady, & Arria, 2010; Hingson, Heeren, Winter, & Wechsler, 2005; Knight, Wechsler, Kuo, Seibring, Weitzman, & Schuckit, 2002; Wechsler, Lee, Kuo, Seibring, Nelson, & Lee, 2002). Educational approaches and medical treatments have been used for high risk students, but the effectiveness of these early intervention and prevention programs has been inconclusive. For example, the most widely used school-based drug prevention program, Drug Abuse Resistance Education (DARE) is taught in all 50 states and 49 other countries around the world (DARE, 2014).

However, more than 30 evidence-based studies have continuously shown that DARE is ineffective in reducing alcohol and drug uses, and it is even associated with increased drug use in some studies (Zernike, 2001). Based on evaluations on the long-term effectiveness of DARE program, the U.S. General Accounting Office insisted that the decrease in illicit drug use was not found among the students who received DARE compared to those who did not (Kanof, 2003). The University of Kentucky has conducted a 10-year follow-up study to track the effectiveness of DARE, and found no significant effect on students by the time they were 20 years old (Lynam et al., 1999). College students' heavy alcohol consumption and driving under the influence of alcohol are serious social problem, and considerable attention has given and several methods have been used. But the effectiveness of programs and education is not always evident. More practical approaches which take into consideration college students' dynamic social environment and life cycle are needed.

The second reason follows from the recent advances in the use of VEs technologies in the health and medical fields. Innovative 3-D virtual programs have been used to reduce burn pain (Maani et al., 2011), smoking (Lee, 2010), drinking (Cho et al., 2008), and phantom-limb pain (Ortiz-Catalan, Sander, Kristoffersen, Håkansson, & Brånemark, 2014). Interactive VEs technologies have been also applied to educating specific techniques, such as saving the life of a person who experiences sudden cardiac arrest, by using "Staying Alive" application. The immersive 3-D based serious game, "Born-to-be-Alive," invites a user to experience the different steps of childbirth. StayingAlive and BornToBeAlive programs were developed in partnership with ILUMENS, the Medical Pedagogic Laboratory at the University of Paris-Descartes and

Dassault Systèmes (PRWeb, 2013). So far, StayingAlive has trained over 15,000 people, while the French National College of Obstetricians and Gynecologists tested BornToBeAlive with mothers at the Port Royal maternity ward, and the responses to the program were positive and enthusiastic (Cap Digital, 2013).

The use of VEs technologies has extended to several areas, such as education, health and medical treatment. If health-relevant behaviors can be changed in a desirable way with an exposure to the use of VEs technologies, then there are great potential VEs to be used in many beneficial ways for a variety of health problems. The question is specifically which 3D interactive situations will be most likely to induce health-related behavior changes. VEs programs developers have focused on the extension of sensor and the realism of visual images. However, what types of VEs mechanisms will be most effect has not been answered.

To understand the potential of using VEs technologies in health-related areas, especially drinking and driving, I proceed by first documenting the range of negative consequences of excessive alcohol consumption and driving under the influence of alcohol, and talking about limitation and problems of current treatments and prevention programs. Next I outline two important theoretical frameworks in which this study is designed to understand the dynamic of VEs technologies. As the theoretical frameworks, I will be elaborating on the “identification theory” within developmental-social psychology (Bandura, 2008; Freud, 1917/1957; Kohlberg, 1966) and the “Proteus Effect” describing the effects of an avatar on the controller’s activities in both offline and online worlds (Yee & Bailenson, 2007; Yee, Bailenson, & Ducheneaut, 2009). Finally, the hypotheses and the research questions to test will be presented.

1.1 Binge drinking and alcohol-impaired driving on American college campuses

The Harvard School of Public Health College Alcohol Study (CAS) has conducted national surveys to assess heavy drinking patterns of college students in 1993, 1997, 1999, and 2001 (College Alcohol Study, 2008). More than 50,000 students at 120 four-year colleges in 40 states participated in this study, and the CAS study primarily measured binge drinking, defined as five or more drinks in a single drinking occasion for male students and four or more for female students (Wechsler & Nelson, 2008). The term, *binge drinking* has now been broadly used, but the exact degree of alcohol consumption varies between and within different cultures. The British Medical Association (BMA, 2009) tends to associate binge drinking with excessive drinking, by labeling that men drink more than 8 units on at least one day in the past week, and women drink at least 6 units on at least one day in the past week. In the United States, on the other hand, the NIAAA defined the term, binge as a pattern of drinking alcohol that reaches blood alcohol concentration to .08 percent or higher, which is about five or more drinks for men and four or more drinks for women (NIAAA, 2004).

Binge drinking has been a persistent problem on America's college campuses (Johnston, O'Malley, Bachman, & Schulenberg, 2008). Studies have documented a number of negative consequences of such a drinking. A crucial part to understanding campuses' drinking culture is that these consequences affect both drinkers and those around them, as a secondhand effect of alcohol drinking (Hingson et al., 2005). For example, in 1994, an estimated 630,000 college students were assaulted, pushed or hit by other students who had been drinking (Hingson, Heeren, Zakocs, Kopstein, & Wechsler, 2002). Wechsler and his colleagues (1995) also showed that sexual or physical assaults,

disruption of sleep or study, and property damage were more likely to occur on college campuses with high levels of binge drinking. More than 97,000 students were victims of reported sexual assault or date rape by another drunken student (Hingson et al., 2005). The cumulative rate of rape and sexual assault on female students appears to be about 25% (Koss, Gidycz, & Wisniewski, 1987). Binge drinking by college students has involved with alcohol-related academic problems, such as missing classes, spending fewer hours on studying, and receiving lower grades (Wechsler et al., 2002). Almost 400,000 college students had unprotected sex, and because of drinking, more than 100,000 students could not recall whether they had a sexual intercourse last night (Hingson et al., 2002). Alcohol consumption among college students is related with the increase in suicidal rates (Westefeld et al., 2006). Drinking is also related with other antisocial behaviors, including vandalism and getting in trouble with the police (Wechsler et al., 2002).

More seriously, binge drinking is closely associated with alcohol-impaired driving in the United States (Flowers, Naimi, Brewer, Elder, Shults, & Jiles, 2008). Based on the national surveys of college students between 1993 and 2001, Wechsler and Nelson (2008) contend that driving under the influence of alcohol is the most dangerous circumstance compared to any situations related to alcohol on college campuses. However, the estimated number of intoxicated drivers increased from 2.3 million (26.5%) in 1998 to 2.8 million (31.4%) in 2001 (Hingson et al., 2005). This serious problem is persistently continued. Hingson and his colleagues (2009) extended the research from 1998 through 2005 and found that about 2.7 million college students between the ages of 18 and 24 drove the car while intoxicated. Beck and his colleagues (2010) interviewed 1,253 first-time

first-year college students annually for 4 years and found alcohol-related traffic risk behaviors by students (driving after drinking or riding with an intoxicated driver) frequently occurred and dramatically increased when students reach the age of 21. Significant consequence of driving while intoxicated included death. The total number of alcohol-related injury deaths increased from 1,575 in 1998 to 1,717 in 2001, and among the accidents, vehicle crash deaths were the major cause (1,349 [32%] of the alcohol-related deaths occurred among college students in 2001) (Hingson et al., 2005). The research from 1998 through 2005 showed that more than 1,800 college students between the ages of 18 and 24 died each year from alcohol-related unintentional injury, including motor vehicle crashes (Hingson et al., 2009). A recent review on alcohol consumption by American college students emphasizes that negative outcomes of alcohol-impaired driving, including death, are seriously constant on college campus (White & Hingson, 2014).

1.2 Education and prevention programs and the issue of effectiveness

Considerable attention and effort have been given to reducing binge drinking and negative harms at different levels, including individual, environmental, and campus-community levels (Hingson et al., 2005; Larimer & Cronce, 2007; Toomey, Lenk, & Wagenaar, 2007). The CAS study has evaluated the role of the “A Matter of Degree” (AMOD) program, an educational program established for prevention of alcohol-related problems by changing campus and community environments, and found significant declines in binge drinking (Wechsler & Nelson, 2008).

However, there has been evidence to suggest that school-based educational approaches and prevention programs may not be effective in reducing student alcohol use

and related problems. In 1999, a Task Force on College Drinking was convened by the NIAAA, and in 2002, the Task Force recommended available prevention strategies to reduce student drinking and related negative consequences (Malloy, Goldman, & Kington, R, 2002). Nelson and his colleagues (2010) examined the implementation of these recommendations by looking at how colleges dealt with excessive alcohol consumption among college students. Three hundred fifty one colleges participated in a national survey of administrators in the United States. The result showed that half of the colleges were introduced to the alcohol-intervention programs for high-risk drinkers, but only few implemented NIAAA recommendations, such as community-based alcohol control strategies including conducting compliance checks to monitor illegal alcohol sales and increasing the price of alcohol. A group of college and university presidents advocated lowering the minimum legal drinking age from 21 to 18, while the NIAAA College Drinking Task Force advised the original minimum legal drinking age as an effective policy to prevent binge drinking (Nelson et al., 2010). The debate about the legal drinking age is still inconclusive, and many colleges, especially schools with small enrollments, have been confronted with the difficulty in providing recommended alcohol-intervention programs because of inadequate financial resource and capacity. Based on a review of school-based alcohol misuse prevention programs, Foxcroft and Tsertsvadze (2011) contend that there was no clear difference between the characteristics of programs showing positive results from those with no effects. Even when an effective prevention program was introduced, the results were found to be different by the circumstances. Jones and his colleagues (2007) also demonstrated that school-based alcohol education had a measurable impact in increasing knowledge about drinking and improving attitudes

in a short-period time, but there was no sustained effect on behavior and no reduction in alcohol consumption or alcohol-related harm among youth. Even the widely adopted school-based prevention program, DARE, has often been associated with increased drug use because the educational message of DARE seems to be more prevalent than it actually is (Zernike, 2001).

Traditional mass media (television, radio, and newspapers) have been used in an attempt to reduce excessive alcohol consumption and alcohol-related risk driving behaviors (Borsari, 2014; Murry, Stam, & Lastovicka, 1993; Tay, 2005; Vingilis & Coultas, 1990). However, the effectiveness of using mass media for preventing alcohol-related negative behaviors is not conclusively successful and firm (DeJong & Atkin, 1995; Smith, Atkin, & Roznowski, 2006; Wakefield, Loken, & Hornik, 2010). Through the study between 1978 and 1996, Yanovitzky and Bennett (1999) showed that the direct effect of mass media on drunk driving was not significant when the impact of legal regulation on drinking and driving behavior was controlled. They emphasized that the impact of mass media on the dynamic social and cultural environment should be considered when researchers examine the media effects on changing health behaviors. Elder and his colleagues (2004) also showed that there is no strict study showing an explicit, direct effect of mass media campaigns on preventing alcohol-related risk driving behaviors. They suggested that using mass media was effective to reducing alcohol-impaired driving and alcohol-related crashes when the well-programmed mass media campaigns were implemented along with other prevention activities, such as vigorous policy enforcement. Tay (2005) emphasized that the successful message type of mass media campaigns was not clearly categorized. DeJong (2002) also suggested that media

campaigns should be carefully developed, implemented and assessed and there was need for more rigorous studies because the direct effect of mass media was not conclusive.

More realistic and practical approaches are needed to prevent negative consequences of drinking and driving on college campuses. Recent studies have shown a unique idea of using the concept of VEs in health-related contexts (Cho et al., 2008; Lee, 2010/2013). Cho and his colleges (2008) demonstrated that in a VEs condition, showing an avatar created social pressure, and then the existence of the avatar caused a higher degree of alcohol craving. In this study, high-level social drinkers were able to reduce needs for alcohol drinking after they were repeatedly exposed to this alcohol craving situation in VEs with an avatar, and it was not important whether or not alcohol was shown in the experimental condition. Using a similar method, researchers in the department of neuropsychiatry at the Boramae Medical Center in Korea, have also found that seven out of ten heavy smokers were able to quit smoking after completing an experiment using a VEs program (Lee, 2010). The experiment was conducted in the following scenario: (a) first, watching a peaceful aquarium image to calm for 3 minutes, (b) then, the screen showing a participant enters a bar to meet a friend, (c) smoke hangs in the air in the pub, (d) people around are all smoking, (e) a friend arrives late and immediately holds a cigarette while complaining stressful life events, (f) the friend smokes and offers a cigarette, (g) participant refuses and says “I’ve quit smoking” (h) the friend shows 20 different kinds of cigarettes and asks “what kind of brands did you usually smoke? (i) the participant chooses his preferred brand and the friend throws a cigarette in front of the participant’s eyes, (j) the participant becomes anxious and incautiously holds the cigarette between the lips, (k) all of sudden, the image on the

screen changes to the aquarium and the participant watches it for 3 minutes, and (1) the participant takes off a computerized helmet. This scenario was constructed based on the survey result from severe patients at the Addiction Treatment Center of the Boramae Hospital. The researchers presumed that patients would have gradually restrained themselves from smoking when they were accustomed to this smoking stimulated situation. This experiment was performed for four weeks and participants were repeatedly exposed to a stimulated situation to be convinced to stop smoking. 3-D stereoscopic graphic program and acoustic system were used to create more realistic images and sounds. Researchers found that the desire for smoking was reduced by 60%, and its outcome is similar to the effect of taking medical treatment like nicotine supplements. A recent report showed that the Boramae Medical Center introduced this 3D VEs treatment to actual patients from January, 2013 and the success rate of smoking secession was 70% after 4 weeks, 50% after 3 months, and 40% after 6 months (Lee, 2013).

The review of previous studies has shown that young college students are exposed to the serious problems of heavy alcohol consumption and drunk driving. Especially, alcohol-related injuries and deaths have continuously increased over the years in the United States, and driving while intoxicated is the most dangerous situation compared to any other circumstances related to alcohol drinking on college campuses. School-based prevention and intervention programs are suggested and implemented at various levels – individual, environmental, and campus-community levels. However the effectiveness of these programs has been inconclusive. Those programs also cost much more than VEs alternatives. Schools with limited financial and human resources will find the VEs

alternative more attractive and useful. More practical and cost-effective approaches are needed to prevent negative consequences of drinking and driving.

Using VEs programs is potentially more convenient for students and cheaper for institutions. Next the question is whether VEs technology can be devised to change students' alcohol-related negative behaviors.

Immersive and interactive 3D VEs technologies have been used to educate and promote healthy behaviors, and produced some successful outcomes (Cap Digital, 2013; Cho et al., 2008; Lee, 2013; Ortiz-Catalan et al., 2014). VEs technology developers have emphasized the improvement of dynamic sensors and realistic graphic images.

Findings from previous studies on VEs can help us better understand and predict perceptual and behavioral tendencies among young college students. To test the VEs program designed to encourage healthy diet behaviors, Peng (2008) divided the experiment participants into two groups: (a) passive observation, and (b) active participation. As expected, participants who were directed to participate in a role-playing game were more likely to adopt healthy diet behaviors. Fox and Bailenson (2009) extended VEs conditions and examined the effect of seeing an avatar which similarly resembled the participants performing exercise. Participants who watched their closely-resembled avatar being rewarded by performing exercise (i.e., avatar losing weight) or punished for not performing it (i.e., avatar gaining weight) were more likely to engage in physical exercises off line compared to those who viewed avatars which resembled other persons. This study showed a positive effect of seeing an avatar which looked like the controller, but a chance to customize the avatar was not given. Using SL avatar creating technology, Kim and Sundar (2012) tested the effects of avatar-customized conditions

(resembled ideal selves vs. resembled actual selves) and avatar-assigned conditions (physically attractive avatar vs. unattractive avatar). This study found positive influence of creating an idealized avatar on encouraging healthy behaviors. Participants who customized their avatar in an ideal image were more motivated to engage in health preventing behaviors (e.g., not smoking or not drinking), while those who customized their avatar in their own actual image were less motivated to encourage in positive behaviors (e.g., doing exercise or going to see a doctor to check medical condition).

While findings of previous studies extended our knowledge of the effectiveness of VEs, more studies are needed to examine specifically which VEs conditions would more effectively promote health-related behaviors in terms of drinking and driving. To understand VEs' potential effects, I review *identification theory*, as the conceptual and theoretical framework of this study, describing what is known about constructing self-identity through emotional connection with a significant person. I also review studies on the *Proteus effect* to how a physically attractive avatar can affect behavioral intention both online and offline.

CHAPTER 2

CONCEPTUAL AND THEORETICAL BACKGROUNDS

Immersive and interactive 3D virtual world, Second Life (SL) invites users to create their own virtual representation, called an avatar. Individual SL users express their desires and expand this online world to a huge social world. They visit SL for multiple reasons such as financial needs (e.g., selling avatar-related products or checking their virtual company like IBM and Apple Store), medical training (e.g., taking cancer classes at the London Oncology Health Center), and interacting with others who are thousands miles away. The present study finds SL very useful because of its most advanced avatar technologies and unique approach to using virtual environments (VEs) on health and medical areas. Recent evidence-based studies have shown positive advantages of avatar-based VEs technologies in promoting healthy behaviors. Researchers constructed several virtual worlds (VWs) for users who wanted to engage in healthy behaviors (Cho et al., 2008; Lee, 2010/2013; Maani et al., 2011; Ortiz-Catalan et al., 2014) or who wanted to be prepared for unexpected situations like saving a person's life (Cap Digital, 2013; PRWeb, 2013). Several VEs conditions were tested and showed that the different levels of interaction with one's avatar influenced the degree of relationship with the avatar (Kim & Davis, 2009b). Creating a virtual form representing the controller's desired or actual self was crucial to encouraging proactive behaviors (e.g., physical exercises) (Fox & Bailenson, 2009; Kim & Sundar, 2012). Even though controllers did not have a chance to customize their avatars, their behaviors were positively changed when they were

represented as more physically attractive avatars (Yee & Bailenson, 2007; Yee, Bailenson, & Ducheneaut, 2009). The controllers seemed to become more confident when they were directed to control a better looking avatar than when they were assigned to control a less attractive avatar. The degree of relationship with one's avatar was also changed by whether or not users had a function to actively control the avatar (Peng, 2008). Active participation in playful activities reduced the emotional distance between the avatar and the controller and this led to engaging in healthy behaviors.

To understand the dynamic VEs relationship to behavior, this study draws upon the identification theory in development social psychology, which explains why and how individuals build their self-identity. This theory can enhance our understanding of why VEs users enjoy creating their online identity by personalizing their own avatar and participating in playful activities through their own control of the avatar. In this literature review, the developmental procedures of the identification theory will be reviewed, and two key factors which can play an important role on building different degrees of relationship with one's avatar will be identified. Following next will be a review of the dynamic relationship between the avatar and the controller and its impact on changing behavioral intentions. As another theoretical frame, the *Proteus Effect* from communication scholars will be reviewed to explain the importance of having a better-looking avatar to represent oneself in an anonymous online world. Two key factors and their impacts on changing behavioral intentions will also be reviewed. Lastly, I will review studies on how controllers perceive negative consequences to the avatar. The overall process model of the present study is shown in Figure 2.1. I will explain in detail each hypothesized relationship in the model in the following literature review.

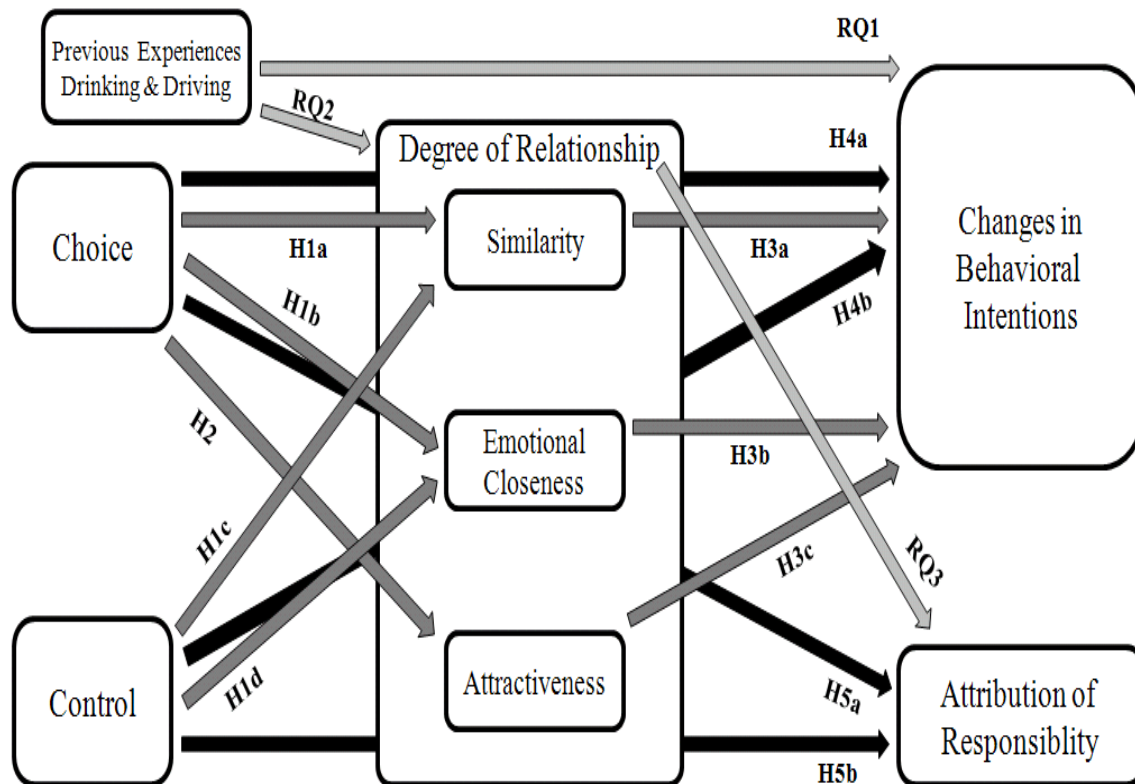


Figure 2.1 A process model of relationship development with avatar and its impact on behavioral intentions and attribution

2.1 Identification theory within developmental-social psychology

From his clinical work primarily with adults, Sigmund Freud (1917/1957) theorized that children tend to relate themselves to significant others in their lives by using two modes of identification. They seek either to *have the other in a powerful/sensual way* (object choice) or to *become the other* (identification). In the object choice, boys relate themselves to their mothers and girls to their fathers. Identification, on the other hand, includes the desire to become like the other, to absorb all of the other's qualities, and to become the other. Freud suggests that, *object choice* is generally preferred at the unconscious level and that identification arises often when object choice is thwarted. In other words, individuals seek first to *have the other*, but when they cannot have the other, they seek to *become the other*.

Albert Bandura (1963, 1969, 2008) agreed with some of Freud's observations, but had different theoretical accounts. His approach is called Social Cognitive Theory (SCT). He has argued that children identify more strongly (in the sense of wanting to be like) with the parent who exercises more power – both reward and coercive power. Reward power generates liking, and coercive power generates fear and respect (Kelman, 1958). When people turn to others outside the family, they find that success in the world (accomplishing the things they attempt) elicits identification and failure does not. In the process of identifying oneself with another person, two key characteristics of the person include credibility and trustworthiness (Fiske, 2004; Hovland, Janis, & Kelly, 1953). Credibility has to do with the expertise and knowledge of the source; trustworthiness has to do with whether or not one can place one's trust in the source.

Another crucial concept in the early identification is the development of gender identity. Lawrence Kohlberg (1966), a significant contributor to the study of moral development and moral education, has shown that once a child sees himself/herself as a boy or as a girl, then he or she becomes interested in doing the things that are sex appropriate in their family and culture. Kohlberg argues that basic sexual attitudes are patterned by a child's cognitive development which tells him/her to do the right things as a boy or a girl. For example, a boy thinks "I am a boy, so I want to do boy things, such as playing with a gun or a toy soldier." A girl, on the other hand, thinks "I am a girl, thus I am wearing a pink ruffled dress and shiny red shoes." This different development tendency is a consequence of children's attempts to classify sex-oriented roles that they observe in the world around and in the media (Weinraub, et al., 1984).

Cohen (2001) brought an idea of identification with media characters, and explained its consequence on identity development. However, Cohen's understanding about the identification process with characters in traditional media should be carefully applied to virtual environments. One major difference is that the boundary between the game characters and the controllers is vague (Klimmt, Hefner, Vorderer, Roth, & Blake, 2010). In addition, the controllers have become more emotionally attached to their avatars (Kim, 2001), and the information of the avatar's graphic image is more personal (Kim & Davis, 2009). Li and his colleagues (2013) examined the concept of player-avatar identification (PAI) in video gaming, and found that PAI was conceptualized with four-factors: feeling during play, absorption during play, positive attitudes toward the avatar, and importance of the avatar to one's self identity.

In establishing self-identity through the processes of identification, two conditions play a key role: (a) having a choice and (b) the roles of activities (i.e., control). The present study examines which VE conditions (having a choice or having a control) has a greater effect on discouraging drinking and driving behavior. Previous studies suggested that both having a chance to create a personalized avatar and having an option to proactively participate in health-related activities can increase the sense of identification with the avatar and it can lead to behavioral changes. To understand the dynamic mechanism of building identity through the development of identification, I will review the literature on the two key variables and their impacts on changing behaviors in the following sections.

2.2 Key factors of identification development and relationship with avatar

Choice. Choice has long been considered as a powerful variable in human behavior. For example, choice is a central determinant of whether or not one feels or has dissonance after engaging in a behavior inconsistent with his or her belief. Davis and Jones (1960) and Cooper and Fazio (1984) showed that without an option to choose, discrepant behaviors did not induce dissonance. Brehm (1966, 1972) showed that attempts to restrict personal choice led to reactant effects or behaviors directly contrary to those advocated by the persuader.

In the study about Yahoo's avatar-customizing service, Vasalou and her colleagues (2008) had a respondent saying, "...well, I do not find eyes which resemble mine... The face does not resemble too much my own (sighs) but it will do... (p. 805)" Another participant said "good, they have hockey because I practice it; I adore hockey (laughs). Making this choice shows a little of my personality (p. 806)." These examples explained how closely the avatar creators felt their characters are similar to themselves when they customized their own avatars. Through a number of surveys and interviews with users who actively participated in avatar-based chatting site, SayClub, Kim (2001) examined the degree of relationship with avatars by users' gender and ages (10s, 20s, 30s or 40s). SayClub provided free avatars to those who first entered to this site, but users needed to spend real money to buy avatar-related items such as clothes, shoes, and hairs if they wanted to make an individualized avatar. This was the world's first charged avatar service, and contrary to pessimistic expectation, SayClub had earned 5.4 million dollars for the first half year for providing this service (Lim, 2001). Kim (2001) demonstrated that different age groups had distinguishable desires to create their character features.

Teenagers focused more on decorating their characters than reflecting their real physical appearances through their avatars because they tended to care more about what others would think about the characters. Females in their twenties and males in their twenties and thirties tried to match their own physical appearances to their avatars. Lastly, the tendency of females in their thirties was not fixed; some of them wanted to have a fantasized visual, while some wanted to make a realistic figure. Interestingly, once the player created and used his/her avatar for a long time, he/she built a strong emotional attachment to his/her character even if the character does not exist in the real world or it does not resemble his/her actual appearances, regardless of his/her gender and age. Kim (2001) showed that the physical features of one's avatar influenced establishing different level of relationship with the avatar and positive feelings toward it. Chung (2005) raised a question, "Why online users were willing to spend real cash on buying untouchable avatar items?" He showed that there was a very strong connection between the attitude toward the avatar and the degree of identification with the avatar. When users established positive feeling about their customized avatar, they tended to identify themselves more closely with the avatar. In addition, Williams (2011) showed that a higher degree of identification with avatars established when participants customized their avatars as physically similar to themselves. Through a survey of 124 SL users, Midha and Nandedkar (2012) demonstrated that a higher degree of perceived similarity with avatars increased awareness of team members in anonymous VEs. The more SL users considered their team to look similar to the avatars created, the more they identified themselves with their team members and became motivated to cooperate with team members in SL.

Previous studies found that having an opportunity to choose the features of one's own avatar enhanced the creator's emotional attachment to the avatar and increased the degree of perceived similarity with the avatar.

Control. The second key factor in developing multiple stages of identification is whether or not individuals have an interactive control over the activities. This study draws directly on the research of Aron et al., (1992) and upon the recent development of VEs technologies by using an option to control a cybercharacter in gaming and virtual worlds. Play is an intrinsically rewarding activity (Piaget, 1962; Ossorio, 1977) so that playing together increases bonds among strangers and newcomers. Aron, Meliant, Aron, Valone, and Bator (1997) have experimentally shown that greater closeness can be created between strangers when they engage in an intense but noncompetitive physical activity, which presumably leads to a physiological arousal, and when they converse with each other on topics that tend to elicit a greater depth of personal sharing of details about things important to each person.

The idea of having control over playing activities has been used in immersive 3D VEs to enhance the outcome of medical treatments. Researchers at the University of Washington's Human Interface Technology Laboratory have developed a virtual reality pain control system, and the Brooke Army Medical Center (BAMC) started using it for service members with severe burn pain (Rawlings, 2011). In the therapy section, patients played a virtual game (e.g., wandering icy canyons) while they took daily-based wound care and dressing changes which could be much more painful than the injuries themselves. The Chief researcher at BAMC, Maani and his colleagues (2011) conducted a study using VEs technology to reducing excessive pain of soldiers with combat-related burn injuries

and found significant results. The degree of pain reduction was higher among patients who suffered from the greatest burn pain and were distracted by participating in a VR program. Patients who suffered from a severe burn pain were more likely to be relieved when they actively engaged in VEs by experiencing white and freezing winter environment. The patient considered themselves as an active member by participating in the winter games even though their physical body was wounded and disabled on tragic battlefields. Patients' active control (e.g., shooting snowballs at mammoths) increased their feeling of presence in a virtual world (i.e. being in freezing winter) and reduced the distance between the game character and themselves.

Using another innovative approach, Ortiz-Catalan and his colleagues (2014) attempted to reduce intense pain that a 73-year-old man experienced for 48 years after losing his right arm in a traffic accident. Phantom pain occurs when patients feel painful sensations of their missing limb after they had amputated. The patient had received various treatments, but none of them were able to reduce his pain, until he volunteered to participate in this VR experiment. Researchers constructed VR environment showing a representation of his amputee on a television screen, and he enjoyed controlling his virtual arm through signals from his damaged limb stump that he had not been able to use for a long period of time. He played games by using his computerized arm and the pain had been dramatically reduced.

The literature review suggests that the perceived degree of the relationship with one's avatar would be different by the degree of choice given in creating a avatar and by the degree to which the person has control over the activities of the avatar created, The degrees of the relationship with one's avatar are assessed with two categories; (a)

similarity judgments and (b) emotional closeness. Based on the two separate key factors, four hypotheses are proposed:

H1a: Participants who have an option to customize their avatar will consider their avatar to be more similar to themselves than those who are assigned a basic avatar.

H1b: Participants who have an option to customize their avatar will consider their avatar to be more emotionally close to themselves than those who are assigned a basic avatar.

H1c: Participants who have an option to control their avatar will consider their avatar to be more similar to themselves than those who are directed simply to observe.

H1d: Participants who have an option to control their avatar will consider their avatar to be more emotionally close to themselves than those who are directed simply to observe.

2.3 Importance of avatar's attractiveness and relationship with avatar

Studies (Morningstar & Farmer, 1991; Rheingold, 1993/2000; Suler, 1997/2001) have shown changes in the last 20 years in the accessibility of computer-based fantasy and virtual worlds in which the players can act out their fantasy with much more vivid and dramatic visual aids. These provide an opportunity to establish a greater degree of relationship with the fantasy aids, so that players in the virtual worlds can make their avatars not only look like themselves but look better in a sense of being trimmer, stronger, sexier, and so on. Individuals can make their avatars look glamorous and muscular if they feel they are not in a good shape or overweight. If they are willing to invest their time and money to create their digital representative, they can be in the online world with better physical appearances.

Kim (2001) examined how users perceived and interacted with their customized avatar in the online chatting site, SayClub, which launched the world's first charged

avatar-service. In this study, a female teenager responded, “Frankly, I wish to have a pretty avatar, but my friends criticized that my avatar didn’t look like me at all. I’d fought with several classmates to keep my avatar, but I was bullied and felt abandoned. After all the troubles, I made two different versions of avatars; the one which looked just like me and another one who I wanted to be shown. I don’t think I’m pretty and I don’t want other people to know that I’m not pretty through looking at my avatar. I like my costumed avatar and spend more time looking for cute and lovely items.”

Since SayClub introduced this paid avatar-customizing service, hacking and prostitutions by teenagers had been a serious problem (Lim, 2001). Teenagers did not have enough money to buy online items but a luxurious avatar was desired by the group of that age, and the users possessing these kinds of lavish avatars tended to lead the flow of conversation. The desire to create a unique avatar rather than a copy of their own physical appearances can be explained by the fact that egocentrism in adolescence dictates them to be preoccupied with *imaginary audience*, who they constantly try to impress (Elkind, 1967). Users who created a visually better version of themselves tend to build a positive attitude toward the personalized avatar and are pleased when other users appraised the physical looks of the avatar (Kim, 2001; Yee, 2006). The following hypothesis is proposed.

H2: Participants who have an option to customize their avatar will view their avatar more physically attractive than those are assigned to a basic avatar.

2.4 Relationship with avatar and its impact on changing behavior intentions

2.4.1 Origin and development of avatar-related technologies

Waskul and Douglass (1997, p 387) examined the construction of personal identity in synchronous chat situations, and found that “Cyberselves emerge in the disembodied and dislocated context of cyberspace and thus cannot be affixed to a body, place, or any other fixed physical thing.” However, their observation during the mid-1990s missed the most embodied form, commonly known as an avatar. The word avatar originates from the Sanskrit word Avatara, which means “descent (Dictionary of Hinduism, 1977).” This term is used in Hindu mythology to refer to the temporary body that God inhabits while visiting earth in order to actualize virtuous deeds.

The basic concept of online game using an avatar first appeared in Maze War, which was developed in the early 1970s at NASA. Maze War was one of the first interactive games with other participants played on networked computers, and game players were identified as eyeballs (DigiBarn Computer Museum, 2008). The earliest computer video game, Spacewar, which was developed in 1961, represented players as spaceship (Computer History Museum, 2008). The first computer adventure game, Colossal Cave Adventure, was operated in text-based communication in 1976 (Bafs Guide to the Interactive Fiction Archive, 2008). Even though the eyeballs looked like blood-shot, popeyed eyes in a black and white background, in the first-person game context, computer players could get a sense by tracking the movements of other participants’ eyeballs, which were moving forward or backward and turning right or left. The eyeball was the tool, which was offering a feeling of presence among the participants in a maze. Players gain points for capturing other players, and lose them for being seized.

The points can be below zero, thus players can enjoy shooting as long as they want. This simple, but innovative game rule became the standard that other shooting games have followed.

The term avatar was first introduced in the fourth in the series of Ultima computer games, Ultima IV in 1985. The goal of the game was to become the “Avatar,” a role model for the people of the land, by mastering eight virtues, which were inspired by Buddhism and Hinduism. The three main principles of the eight virtues were Truth, Love and Courage. In the later versions of the game, “Avatar” was the player’s visual online persona which s/he could modify by selecting various appearance items (Kasavin and Soete, 1998).

The use of avatar became very popular after Neal Stephenson’s (1992) breakthrough science fiction novel, *Snow Crash*. Since this, he has been listed as a “cyberpunk” writer along with William Gibson and Rudy Rucker. In this novel, the avatar was the iconic representation of the bodies of people who logged into the Metaverse, a virtual world. The story began with a young, pizza delivery guy who lost his job because he could not make his delivery on time. But, in the virtual world, he was a great sword-fighter hacker who made most of the programs and ruled the cyberworld. When a dangerous drug, Snow Crash – both a computer virus capable of infecting the brains of hackers in the Metaverse and a real virus – was rapidly spread in the network, he designed a computer program and saved both the real world and cyberspace. In this scenario, the avatar was the virtual body, which ensured the existence of participants in the real world.

In general, avatars are visual self-representations of users in a virtual world through 2-Dimensional or 3-Dimensional environments. In 2D environments, users can choose one of the avatars, as a complete form, but they do not have various options to create a customized avatar by selecting different items. For example, in 1986, LucasFilm Games developed Habitat. In Habitat, an avatar has one head and a body that can move around the space on the screen, and users' messages immediately appear above their own avatar's head when they type something on the keyboard (Morningstar & Farmer, 1991).

Unlike 2D, users in 3D environments can make "combination" avatars by customizing several options, such as skin tone, height, weight, head stretch, forehead angle, eyebrows, eye color, nose width, lip ratio, mouth position, jaw shape, hip width, foot size, hair style, hair color, body shape, etc. In the mid 1990s, with the wide spread of the Internet, virtual worlds started attracting the public's interest. The Palace became one of the well-known chatting systems, beginning the chatting service to the public in November of 1995 (Suler, 1997). Based on the observation, Suler (2001) divided characters in the Palace into several categories, like animal, cartoon, celebrity, evil, and real face, and found that each avatar had different meanings (e.g., animals imply certain traits such as strength, loyalty, or independence, while celebrity's image can represent intelligence or power).

A more advanced 3D avatar model was launched in Second Life (SL), which was developed by Linden Labs in 2003. After gaining major attention from the mass media in 2006, Second Life was honored at the 59th Annual Technology & Engineering Emmy Awards for outstanding achievement in technical development with user-generated contents in 2008 (Reuters, 2008). SL users, called "residents," can walk, run, fly or

teleport (TP), moving instantly to other places. They meet and interact with other residents, take classes, attend music concerts, or build a variety of virtual objects, such as houses, dance clubs, shopping malls, hospitals, etc. They also can express “happiness” by making their avatar do an upbeat be-bop dance, or “anger” by making their avatar lash its arms or wave its fists with a few clicks of the control keys. If they need more dynamic gestures and facial expressions, they can purchase animations or pose-balls with cash, since SL has its own exchange tool of currency, the linden dollar (L\$).

In an observation of participants, Bardzell and Odom (2008) met a female user, saying “[My home] allows me to escape from Ithaca and also my RL [real life]. This is where I can be me....I have probably spent more time in my SL [Second Life] house than I have in my RL [real life] house this year. My SL house is where I escape to.” In their views, avatars acted as physical bodies and became altered egos in the virtual environments (VEs).

Since the first avatar emerged in the cyberworld, they have been transformed from a simple game character to those capable of a significant range of interpersonal behaviors. Dynamic behaviors beyond imaginations provide the means for more meaningful interactions in VEs. Unique avatars imply significant meanings and become interactive tools which can provide more information about the controllers in the anonymous online world. Since avatar-related items cost real money and having customized avatars mean that the controllers are accustomed to this new cyberworld and have better social-economic standards.

2.4.2 Negative consequences to the avatar and its impact on changing behavioral intentions

The avatar has become not merely a communicative tool but a representation of the users themselves in an ideal form. Jones (2006) contends that avatars are extensions of the self and expressional tools, which show various aspects of the self. Wolfendale (2007) emphasizes online users' emotional attachments to their characters and the great degree of similarity and closeness with the avatars. She argues that avatar attachment should be treated as being morally significant because harm to the avatar is considered equal to the harm to the controller. Even in 2D environment, Habitat, users' avatars only having one head and a body, could be killed by other players, and the death of avatars became a cause of depression to the owners (Rheingold, 1993). 3D avatar-based environment provides more interactive functions, and negative experiences would leave significant loss to the controllers. The present study examines the effect of VEs on changing negative behaviors (i.e., driving while intoxicated). Several experimental conditions are constructed by using the SL avatar service and the changes in behavioral intentions are assessed after showing the most negative consequences of driving under the influence of alcohol (i.e., a vehicle accident). The following anecdotal stories are reviewed to better understand the impact of negative consequences to the avatar on changing behavioral intentions.

1992 LambdaMoo Rape Case. Pavel Curtis created and managed LambdaMoo in 1990. LambdaMoo (Moo: MUD (Multi-user Dungeon) was one of the most well-known online communities of the 1990s. It allowed multiple users to interact with other players by using avatars. What has become known as the "rape in a cyberspace" was performed

by an avatar that used “Mr. Bungle” as his username on the computer screen. Julian Dibbell, a writer, who was curious about individual activities and social interactions on LambdaMoo, introduced a detailed story telling what really happened on that night in 1992. He kept observing events in LambdaMoo, and finally revealed more stories in his book, *My Tiny Life* in 1998. The “cyberrape” happened in the living room, which always welcomed visitors with warm affection along with cozy decorations. Dibbell (1993, 1998) described that Mr. Bungle was, “a fat, oleaginous, Bisquick-faced clown dressed in cum-stained harlequin garb and girdled with a mistletoe-and-hemlock belt whose buckle bore the quaint inscription *KISS ME UNDER THIS, BITH!*.” On a Monday night in March, Mr. Bungle started using his “voodoo doll” subprogram to force other participants to serve sexual acts in a variety of ways. The victimized characters were forced to perform sexual actions each other and even these actions went far beyond the community norms, which contained tacit agreements in the socially constructed world. Whenever each degrading sexual act was performed, Mr. Bungle’s distant laughing sound kept coming back. One of victims disclosed her damaged feeling to Dibbell, saying “posttraumatic tears were streaming down her face.” Another victim berated Mr. Bungle’s voodoo doll activities and said, “I am requesting that Mr. Bungle be toaded for raping Moondreamer and I [sic]. I have never done this before, and have thought about it for days. He hurt us both.” This heart-breaking story raised the most important question about the distinction between real-life and virtual reality (a.k.a., augmented reality, mixed reality, artificial reality). Interestingly, those owners whose cybercharacters were persecuted, regardless of their intentions, felt that they were raped by an unknown person who had “breached the norms of civility.” To them, harm to their characters means equal

harm to them, real people in the real world. There was no distinct emotional gap between the owners and their avatars. This story demonstrates that users may feel the same way their characters feel and how their real lives can be influenced by the experiences of their characters. The 1992 rape case shows a close emotional tie between the creators and the characters.

2008 Virtual Murder Case in Japan. The virtual murder case happened in Japan, but received major attention from the US and international newspapers (BBC, 2008; CBS News, 2008; CNN, 2008; FOXNews, 2008; USA Today, 2008). A 43-year-old Japanese piano teacher entered to a popular role-playing game, “Maple Story” to execute the murder of her virtual husband (i.e., she logged on with his password and deleted his virtual character). The investigators asked the reason for her action, and she confessed, “I was suddenly divorced, without a word of warning. That made me so angry.” A 33-year-old office worker complained to the police that he was desperate when he found his beloved character no longer existed. They met in a chat room in Maple Story and their initial chat conversation led to build a romantic relationship. He proposed marriage to her without knowing that his virtual wife was actually a married woman in the real life. They happily married and he trusted her enough to give his account information, ID and password. But he ended the marriage, because he simply got bored.

Now, she has been arrested on a charge of illegally accessing her virtual husband’s online account and manipulating his electronic data. She has not yet been charged, but if convicted, she could be imprisoned up to five years and fined up to \$5,000. In her defense, she stated that she had not engaged in any illegal, retribution actions in the real world.

Through the review of the stories which happened either online or in the real world, strong and emotional connections between controllers and their avatars are observed. Once users build a close relationship with their avatars, negative accident happening to the avatars can be translated into the controllers' personal loss and intense grief, which in turn may induce changes in certain behaviors. Through dynamic interactions with the avatars, the controllers may become to view their avatars as being similar to themselves and the emotional distance between the controllers and their avatars can be shortened. Therefore, in the present study, if participants experience a tragic accident and harm to their avatars, I expect that intention to make a certain behavioral change will be induced, and the size of the intention to change behavior will vary, depending upon the degree of relationship with their avatar. I believe that those with a close relationship with their avatars – in terms of similarity, emotional closeness, and attractiveness – will indicate greater intention to change their behaviors after experiencing virtual car accident.

2.4.3. The Proteus Effect

The notion of *Proteus Effect* is based on the Greek myth in which Proteus is the first-born son of Olympus and has the ability both to change shape and to foretell the future. In Jungian psychology, Proteus is taken as a symbol of the unconscious. Yee and Bailenson (2007) showed that participants' activities were influenced by their avatars' appearances. In their study, the participants did not have an option to choose their avatars' features but they were engaged in an active play in a virtual world. They took one aspect of the conditions conducive to building the degree of relationship with an avatar (i.e., holding a physically attractive avatar) and showed that it had the power to influence some behaviors. Yee, Bailenson, and Ducheneaut (2009) extended their

research to face-to-face interactions and found that a better virtual form had a significant influence on changing a creator's behaviors both offline and online. For example, the participants with a taller avatar tended to act more confidently and aggressively than those with a shorter avatar in the round of negotiation. The participants who were assigned to play with a more attractive avatar tended to show increased self-disclosure (more extraverted and friendly) and were more likely to approach a stranger with an opposite gender than the remaining participants who were assigned to play with a less attractive avatar. In these studies, an option create a personalized avatar was not given, but behavioral changes were observed when users were directed to control a better-looking avatar.

The review of previous studies and two theoretical frames, the Identification Theory and the Proteus Effect show that through interactions with avatars, users can build different degrees of relationship with their avatars, which in turn can be related with different levels of intention to make behavioral changes in their own real worlds. The more the avatar looks physically attractive, the more likely the person will intend to change their behaviors. The degree of the relationship with one's avatar was assessed with three measures; (a) similarity, (b) emotional closeness, and (c) physical attractiveness (see Figure 1). Three hypotheses are proposed:

H3a: The more participants find their avatars similar to themselves, the more likely they intend to change behaviors positively.

H3b. The more participants find their avatars emotionally close to themselves, the more likely they intend to change behaviors positively.

H3c. The more participants find their avatars physically attractive, the more likely they intend to change behaviors positively.

2.4.4. Key factors of identification development and their impact on changing behavior intentions

Choice. Kim (2001) suggests that avatar creators tend to identify with what they have made, and to those players, their characters are no longer just communicational tools or methods; they become so strongly identified with their avatars that when something happens to the avatar, they may feel it has, in fact, happened to them.

Fox and Bailenson (2009) conducted several experimental studies to show the effect of playing with avatars on changing users' behaviors in a desired way. In the first study, users were randomly assigned to one of three different conditions: (a) seeing their avatar getting rewarded as they participated in proactive behaviors (i.e., avatar losing weight) and watching their avatar getting punished as they did not engage in vigorous activities (i.e., avatar gaining weight), (b) their avatar's visual figure was not changed, and (c) no visual image. A significant effect was observed from the condition where avatars were rewarded and punished. In the second study, two different VR conditions were added: (a) playing with an avatar customized to look similar to users' actual physical appearances, and (b) playing with an avatar with someone else's visual image. A greater effect was observed when the users played with an avatar customized to look similar to themselves, indicating the having an option to choose user's own avatar can produce a greater intention to change behaviors.

Kim and Sundar (2012) extended VEs conditions into four groups: (a) having an option to customize the avatar to resemble users' ideal images, (b) having an option to

customize the avatar to resemble user's actual images, (c) having an option to control a physically attractive avatar, and (d) having an option to control a less attractive avatar. The study found that the participants who were given an option to choose their own avatars indicated greater tendency to maintain their self (e.g., going to the gym or jogging) compared to the no-choice group. In the study, SL users who customized their avatar as their idealized image indicated greater intention to engage in preventive behaviors (e.g., not smoking or not drinking), while those who customized their avatar as representing their actual image were less motivated to encourage in healthy behaviors (e.g., exercising or going to see a doctor for a check-up). Finding of this study suggests that having a functional option to create an individualized avatar will increase one's intention to change behaviors.

Yoon and Vargas (2014) found that participants who were assigned to control heroic avatars (Superman) showed more prosocial behavior (giving more chocolate for future participants) than those who were assigned to control villainous avatars (Voldemort). Participants who controlled the villainous avatars showed more asocial behavior (giving more chili sauce) than those controlled the heroic avatars. In this study, more heroic avatars played a major role for the controllers to be more likely to engage in prosocial behavior.

Control. Peng (2008) examined the effect of having different degrees of control over the avatar's activities on promoting healthy behaviors. Participants were divided into two experimental conditions: (a) active participation group (playing a healthy diet promotion game) and (b) passive observation group (only watching a computer screen with a captured video of other person's game playing). The result showed that the group

that heavily engaged in active role-playing game were more likely to adopt healthy diet behaviors and had a higher degree of identification with the character in the program than the participants in the passive observer group. It was also found that the degree of relationship with the character mediated the association between experience mode (active participation vs. observation) and the intention to engaging in healthy behaviors. In fact, players who had an option to control their avatars were more likely to identify themselves with their avatars and indicated and this higher degree of identification with the avatar was related with greater intention to engage in healthy eating behaviors.

Through SL chatting, Dean and his colleagues (2009) interviewed 29 SL users who participated in the study conducted by the Centers for Disease Control and Prevention (CDC). This study found that SL users who engaged in proactive behaviors (e.g., running or dancing) in SL were also more likely to perform physical activities in real life. It is suggested that healthy activities in a virtual world can lead to proactive behaviors in real life.

Yoon and Vargas (2014) compared the VR conditions: (a) controlling the heroic or villainous avatar, and (b) observing someone else's playing as the heroes or villains. A significant interaction effect was found. Participants who were assigned to control the heroic avatars showed more pleasant behavior (giving less chili sauce for future participants) than those who observed another person's game playing with the heroic avatars. Participants who controlled the villainous avatars showed more unpleasant behavior (giving more chili sauce) than observed participants of someone's playing with villains. Thus, the following hypotheses are proposed:

H4a: Participants who have an option to customize their avatars will indicate a greater intention to change behaviors more positively than those who are assigned to a basic avatar.

H4b: Participants who have an option to control their avatars will indicate a greater intention to change behaviors more positively than those who are directed to simply observe.

2.4.5. Previous life experiences related to drinking and driving

In this study, participants will experience negative consequences of binge drinking and driving caused by their avatars (seeing someone else's vehicle on fire with serious injuries to those inside) after participating in an enjoyable alcohol-involving party.

Observing the car crash occurred under the influence of alcohol, I predict, will affect participants' perceptions about the vehicle accident by binge drinking and their intention to change their drinking related behaviors. In addition to this negative experience, I question whether participants' previous life experiences related to alcohol and driving can affect their intention to change behaviors:

RQ1. To what degree will changes in behavioral intentions be a function of one's prior use of alcohol and one's experience with alcohol-related accidents?

I also question whether participants' previous experiences will be related with their perceived relationship with the avatar one way or another:

RQ2. Will one's prior use of alcohol and experiences with alcohol-related accidents be related with the perceived relationships with his or her own avatar?

2.5 Attribution of responsibility for the crash and relationship with avatar

The present study deals with one of the most stressful life events, car accident caused by an intoxicated driver. Even though the vehicle crash occurs in a virtual world and participants experience it only through a pre-recorded video clip, their avatar will be shown in the individualized video and the vehicle will be seriously damaged (i.e., getting on fire). It is important to examine who the participations attribute responsibility to and how much they hold themselves responsible for the car accident.

Bowman and his colleagues (2012) examined the effects of pro-social online game playing (i.e., interacting with other users and maintaining the relationships) and anti-social game playing (i.e., violent gaming). They found that participants' emotional attachment to the game character played a central role in shaping the perception that the participants themselves are responsible for the consequences resulting from the character's actions. Playing an anti-social game was associated with a lower degree of attachment with the character and a lower degree of taking responsibility for the character's actions. It was also found that those who wanted to play anti-social games were less fearful of negative consequences of the actions.

According to the Attribution Theory (Jones & Davis, 1965), if people find a person "insincere" or "greedy" from their own observations, these negative expectations about the person become the basis of their generalized negative attributions. With negative expectations, people worry about the person's next course of actions and try to protect themselves from potential risks. Having to interact with the person adds to the urgency of self protective motivation (Darley, Fleming, Hilton, & Swann, 1988; Harris &

Perkins, 1995), and studies show the perseverance of expectancies in various conditions (Epley & Kruger, 2005; Harris, 1991).

In the age of the Internet, online chatting has become an excellent medium for interacting with complete strangers. In terms of forming impressions, on-line representations, including nicknames (a.k.a. nicks), avatars, and self-descriptions, have received significant research attention (Bechar-Israeli, 1995; Jacobson, 1999; Kim, 2001; Kim & Davis, 2009b; Wallace, 2001; Waskul & Douglass, 1997; Weibel, Stricker, Wissmath, & Mast, 2010).

A nick is a single form of associated words, and it can be a fundamental element to decode gender of users before participants get to know each other (Wallace, 2001). For example, if a nickname, “Wild-Foxy” enters a chatroom, other members might recognize this user’s gender easily. At the same time, it may lead others to perceive this person to be a promiscuous party lover. Male users might make suggestive remarks toward her from his biased stereotypes. In fact, it is important what type of nicknames users choose when they have a chance to create their digital identity by themselves because the nick is the first clue showing some sides of persona in anonymous cyberworld before they start a conversation.

In “Internet relay chat” (IRC) users can change their nickname easily, but they infrequently do and steadily use their same nick for a long time. As self-presentation in immeasurable chat rooms, the same nick can be an important part of each user’s digital identity. The largest category (45%) was related to the self in various ways (<shydude>, <stoned>, <baddady>) (Bechar-Israeli, 1995), while Waskul and Douglass (1997) found

that some nicks were based on the person's hobbies, interests (<GuitarPickn>), lifestyles (<VegDiet>), and a individual's motives for chat-interaction (<PhoneFun4u>).

In contrast to nicks, there is no limit on lengths, styles, and themes of a profile and a self-description. As more informative resources, the profile may include a member's real name, location, birth date, gender, and others (Waskul & Douglass, 1997), and the self-description is a self presentation making claims to a person's place in their joint social worlds (Goffman, 1959). The description becomes more in depth as the users list their favorite wise remarks, ideal mate, career, hobbies, views of life, prior marital experiences, etc. Profiles and descriptions offer users more time to write contents, thus when others view unfinished sentences and repetitious spelling errors, this tendency to judge negatively become more serious (Jacobson, 1999).

Kim (2001) showed the effectiveness of graphic images that reveal more personal characteristics. Weibel and his colleagues (2010) explained that avatars with large pupils and slow eye blink frequency were considered as more sociable and more attractive. Especially, the animated character's movements can be interpreted as transformed social-emotional information. Jacobson (1999) found that using a simple nickname in chat rooms had no role in forming impressions; rather it was interpreted as uptight, boring and uncreative by other users, while an avatar shaking its hands meant a nice, warm and sociable character.

Kim and Davis (2009b) applied the attribution theory and the expectancy effect to examining whether or not participants with an initial negative expectation about a female target tended to confirm their prior expectations, and how different communication conditions could influence the participants' perceptions about the target. The female

target was described as unfriendly and egoistically to a neighbor and to her classmates. Results revealed that participants responded differently depending upon the types of information they received. Participants who received avatar-based identity cues were more likely to say that the female's situation (i.e., she is recently raped by a stranger on the way home after work) changed her attitudes toward strangers than those who received text-only cues (e.g., the female target's nickname was "suspicious_blue82"). It is likely that the participants were able to identify more closely with the female when they watched the avatar's frowning facial expressions and dynamic body gestures, while those who only received written messages could not go beyond their prior negative impressions. This study also asked participants whether they would initiate a conversation with the person based on the information they received. In that condition, those who received avatar's visual images saw her as ready for a new relationship, while those who received only text message saw her as completely unready. This finding can be interpreted as indicating that participants who received avatar-based graphic information were more likely to spend more effort in evaluating the female target's situational reason to correct their previous negative assessment of the target. As a result, they were more likely to get acquainted with the target because they thought that her negative responses would be changed by a recent tragic accident.

The present study examines a dynamic relationship between participants and their avatars in a health-related context. Findings of previous studies suggest that users who have an option to customize their avatars and those who have an option to control their avatar's activities are more likely to perceive a close relationship with their avatars. This

close relationship with the avatar, I hypothesize, will lead users to take a higher degree of responsibility for the consequence of the avatar's action, a vehicle crash.

H5a. Participants who have an option to customize their avatars will be more likely to attribute responsibility to themselves than those who are assigned to a basic avatar.

H5b. Participants who have an option to control their avatars will be more likely to attribute responsibility to themselves than those who are directed to simply observe.

I also question how one's perceived relationship with the avatar (similarity, emotional closeness, and attractiveness) can affect the he or she attribute responsibility:

RQ3. How participants' perceived relationship with avatars will be related with taking responsibility for the consequences of avatars' actions?

CHAPTER 3

METHOD

3.1 Overview of the experimental design in session 1

In the first session, participants were assigned into one of the three conditions. These three conditions were designed to compare the effects of having an option to choose participants' own avatars (choice), having an option to control avatars' activities, and having both options. The following provide detailed description of each experimental condition:

(a) choice and control condition: 1) after watching a series of short video clips showing how SL users create their avatars and how to control the avatar to participate in different activities in SL, participants customized their avatars by adjusting various parts, such as skin tone, height, musculature, cheek prominence, length of arms, nose shape, eye color, lip fullness, hair style, and hair color. Then, participants chose clothes and accessories to personalize their avatars. Two freebie stores were used because of the convenience of getting different outfits and variety of avatar-related items for free. Figure 3.1 shows the multiple scenes that allowed female participants to create their own avatars. 2) With the ability to control their own avatars, participants engaged in fun activities available in SL, such as flying in a hot-air balloon, hang-gliding, skiing, bungee jumping, bobsledding, riding on a ski lift chair, snowboarding, and ice-skating (Figure 3.2). Participants wandered around various SL places, from village to ocean to mountain to amusement part. Access to alcohol-related activities and driving a car or motorcycle was

not yet provided in these places. At the end of the session, participants were informed that they would participate in a dance party in SL at the second session. For the last several minutes, participants checked their looks in order to be prepared for the party, and then ended the first session. The examples of the avatars created by the participants are shown in Figure 3.3.



Figure 3.1 Screen snapshots of the processes of customizing an avatar in SL

(b) No control and choice-only condition: 1) participants watched a video explaining how to put clothes on an avatar, and then customized the avatar with distinctive physical features and clothes which show the participants' personality and desire. However, a chance to actively engage in playful interactions in SL was not given. Therefore the participants did not have an option to control their own avatars. 2) After creating the avatar, participants watched another video showing someone else's participation in different activities in SL. Participants were informed to think that the

avatar they were watching in the video could be their character and pretend that they were in SL.

(c) No choice and control-only condition: 1) participants watched a computer screen showing someone else's customizing an avatar. Participants were told that they should try to feel empathy with the avatar in the video because the avatar could be their character. 2) They watched one more video clip giving information about how to enjoy activities through the control of the avatar. Then, participants entered a ski resort and experienced fun winter sports by controlling their avatars. The examples of twelve basic avatars are shown in Figure 3.4. Other summer activities, including riding a whale and boardsailing, were also made available.



Figure 3.2 Screen snapshots of the lists of possible activities in SL



Figure 3.3 Examples of customized avatars in the choice and control condition



1



2



3



4



5



6



7



8



9



10



11



12

Figure 3.4 Twelve different types of basic, completed avatars for beginners in SL

3.2 Overview of the experimental design in session 2

In the second session, all participants engaged in a typical “hard partying” in SL, which presented an opportunity and peer (avatar) pressure for heavy drinking of alcohol (Figure 3.5). Drinking alcoholic beverages is common and fun in SL. A number of SL item creators especially design alcohol-related products because of the tremendous popularity and continuing demand of SL users who want to enjoy more fantastic activities in the online world. These pre-programmed and animated items make it possible for the online game characters to take a swig of beer or Jack Daniel’s from bottles and get wasted (ex. puke on a toilet with sick sound or walk with a slight limp while holding a beer bottle). There are also numerous dance clubs in SL with a variety of specialized target audiences (ex. gay bar or vampire bar). In the present study, the dance club was carefully chosen with the following criteria: (a) a DJ plays all kind of dance music persistently, and a lot of SL users visit regardless of the experiment times, (b) drinking alcoholic beverages at the club is quite common and fun, (c) the club should be a specially designed place to socialize, and alcohol is easily accessible, and (d) the club maintains free admission.

In the club chosen for the present study, an experienced disk jockey with two gaudily dressed back dancers played electronic dance music constantly. Various alcoholic and non-alcoholic beverages were pre-added in a participant’s SL inventory. Before the second session (T2) starts, participants were informed how to control their avatars to dance and drink any beverages. The result of the pre-test showed that about seven percent of the entire participants in each experimental condition chose not to drink any alcoholic

beverages and the average number of drinks participants consumed at the party were about 3.5.



Figure 3.5 Screen snapshots of avatars dancing and drinking beer at the club in SL

In the experiment, each participant in the choice-only condition watched an individualized video clip that presented his/her avatar being actively involved in an alcohol-involving dance party, while other participants in other conditions controlled their avatars to enjoy the new experience at the club in SL.

After the dance party, participants were introduced an opportunity for a second exciting party with interesting avatars at a second location, which required a transportation. Several computer-based experimental conditions created an attractive and convenient circumstance in which participants felt obligated to drive (Figure 3.6). To make the participants think that they have the responsibility to drive, participants were told that that a randomizing program to choose a driver would be used, and the program was designed to pick the participants. A higher level of responsibility was formed when

the participants were asked to accompany a person with a same-gender, who was at the dance party and quite intoxicated.

Did you have fun?

Now this party is over.

There is another party you are invited.

We pick a random driver for driving a vehicle to move that party.

When you press a "enter" key below, our random program will tell you whose avatar is chosen to be a "driver."

☐ Click "enter"

>>

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Your avatar has been chosen to drive a vehicle.

Ellen came because it was her birthday, and she had a very good time.

Did you meet "Ellen" at the party?

She was dancing on the dance floor.

She had a lot of fun at the party, she drank somewhat more than she normally does.

She wants to go another party!

Would you invite her to ride along with you?

☐ Yes

>>

Figure 3.6 Screen snapshots describing the process of how the driver was chosen at T2

Then, all participants individually watched the video clip that showed a tragic accident to another car, which occurred as a consequence of the avatar's drunken driving. The following described the video clip: (a) the participant's avatar and a same-gender person who was at the dance party are standing on the street, (b) the same-gender person is holding a beer bottle, (c) the participant takes out a fancy sport car from the SL inventory and sits on the driver seat, (d) next, the same-gender person sits on the

passenger seat, (e) the participant's avatar drives a car and tries to make a turn, (f) the avatar's car hits another car on the road and this car is instantly wrapped in flames.

During the drive to a new party location, the vehicle that the participant's avatar was driving crashed, and caused a serious damage to all passengers in the vehicle (Figure 3.7). Immediately following the crash and the resulting damage to each avatar, participants were asked to complete a brief survey that measured immediate emotional reactions to the crash (distress, sense of guilt, anxiety, shame, blaming of others), attributional processes (thinking who is responsible for the crash) as well as the follow-up assessments of ratings of their own relevant behavioral intentions with respect to drinking and driving. Figure 3.8 provides detailed descriptions of each session in a diagram. The exact measurement question wording is reported in Appendix C and D.

3.3 Participants

One hundred eleven participants (94 women, 17 men) were recruited from two undergraduate introductory mass communication and research method courses (Survey of Mass Communications and Research Methods) at the University of South Carolina. The use of a student sample is always a problem in terms of its generalizability, but can be justified in a sense that young college students are the key users of online virtual games and programs (Kim & Davis, 2009a).

The majority (93.7%) of the participants fell in the 18-21 age range, with a mean age of 19.4 years ($SD = 1.74$ years). The sample included 46.8% freshmen, 23.4% sophomores, 24.3% juniors, and 5.4% seniors. The sample was mainly Caucasian (84.7%). All participants had a driver license for vehicle or motorcycle (100.0%). The data collection was completed on April 16, 2010.



Figure 3.7 Screen snapshots of the procedures of an accident at T2 in a video clip

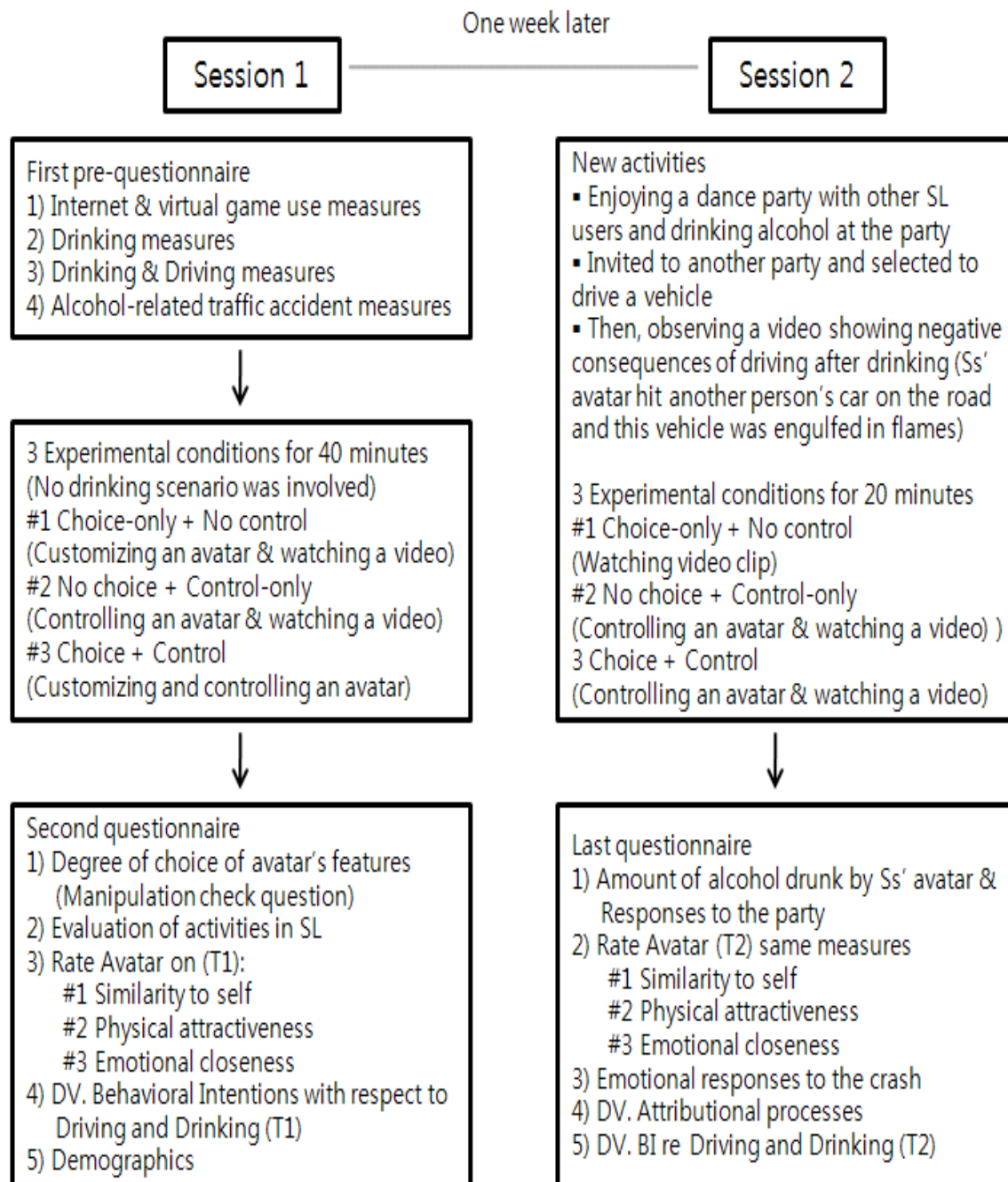


Figure 3.8 Diagram of the flow of procedures and measures


3.4 Procedure

The experiment was administered individually to participants in a computer laboratory. Upon their arrival at the lab, a female experimenter greeted the participants and provided them with a concise oral introduction to the experiment. The experimenter

then escorted each subject to a seat facing a computer monitor and the complete written instructions were placed on the computer desk separately.

Before participants came to the lab, they were informed through an email that those who volunteered to participate in this experiment needed to create their own SL account to save the experiment time. Detailed information of how to create a SL account was given to the participants individually. The SL site provides twelve basic avatars. A female participant was informed to select one of six female avatars while male participants chose one of the remaining six male avatars. All participants chose a gender-appropriate avatar and only played SL during the experiment time period (one week).

Prior to conducting the experiment, participants were informed that the purpose of this study was to learn more about individuals' Internet use in general and their use of online games in particular. Participants volunteered to participate in the first one-hour experiment session and the second 40-minutes session in return for an extra credit toward a course requirement issued with the permission of the instructors of the courses. An online survey, Qualtrics, was used as an alternative to a paper-and-pencil questionnaire. The example of the online survey used to measure the degree of feeling about the SL activities is shown in Figure 3.9.



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About the activities in SL, how you describe your feeling?

	Not at all	Slightly	Somewhat	Moderately	Fairly much	Very much	Extremely
1. I was confused.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. I was bored.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I liked and enjoyed activities in SL.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I cannot understand why people play this game.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I want to play SL more.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please describe in three or more sentences the activities you did in Second Life.

>>

Figure 3.9 Screen snapshot of one slide of Internet-based questionnaire measured at T1

After completing a pre-questionnaire, which asked several questions regarding daily Internet uses and alcohol consumptions, a second questionnaire was administered at the end of the 40 minutes play period for those in the choice and control condition. Participants in the choice-only condition, spent about 20 minutes to customize their avatars, and watched a video that showed their own avatars participating in various summer and winter activities. Participants in the control-only condition, watched a video clip of someone creating his or her own avatar, and for the remaining times, they actively engaged in different activities by controlling their avatars for 20 minutes.

After participants completed the 40 minutes participation in SL at T1, they filled out the second survey that measured their degree of relationship with the avatar (as a check on the stability and duration of initial effects). Then, they were asked to rate the

degree of behavioral intentions in terms of driving under the influence of alcohol. At T2, after the dance party, the same aspects of the participants' ratings of the avatars and the same measures asking the degree of behavioral intentions were asked at the end of the session.

This study asked several age-related sensitive questions, such as underage drinking and driving behaviors. Strict and complete research protocols were required and the consent form was fully explained to inform the participants of potential risks and benefits related to the study. Safeguards to protect confidentiality were also fully explained. At the end of the session, the experimenter explained the true purpose of the study and how individual information will be processed and stored to protect privacy. Informed consents were solicited and a written debriefing form was also provided to each participant (see Appendix A and B). The university's institutional review board were fully examined the study, and all the procedures were approved by IRB on March 19, 2010.

3.5 Measurement

3.5.1 Pre-questionnaire at session 1 (T1)

Experience with Internet and virtual worlds. Information was obtained in five categories: (a) the longest time using the Internet in a day, (b) experience of playing 3-D virtual world programs (yes or no), (c) frequency of playing games (1 = rarely; 4 = occasionally; 7 = often), (d) duration of playing games in the past 6 months, and e) duration of playing games during the 11th and 12th grades. Kim and Davis (2009a) show that these questions are valid measures of general Internet usage of college students, and

the frequency and the duration of Internet use are significantly related to students' problematic Internet use.

Among the 111 college students, the majority (78.3%, $N = 87$) had experiences of spending more than 3 hours a day on the Internet. About 55.0% ($N = 61$) of the participants had ever played one of the example virtual games (e.g., World of Warcraft, Kaneva). The mean of frequency of playing games was 2.20 ($SD = 1.70$). Average of playing games in the past 6 months was 0.65 ($SD = 2.32$) while the mean during the 11th and 12th grades was 2.66 ($SD = 8.32$).

Demographics. Participants' gender, age, academic year, and ethnicity were assessed. Members of all ethnic and groups other than whites were treated as "other" because of the small portions. Among participants, 83% were under the age of 20, and white students were the majority (86%). Instead of recruiting only students over 21 years of age, I decided to recruit all volunteering students, given the prevalence of under-age drinking on college campuses (Beck et al., 2010). The survey was confidential, and I believed that students would not be discouraged from giving honest answers regarding their drinking behaviors. I also considered the fact that students under 21 would be the ones that would benefit the most from the findings of this study.

Daily alcohol consumption. The level of alcohol consumption was assessed with three measures: a) hours spent consuming the maximum number of alcoholic beverages, (b) times of having binge drinking (5 or more drinks for a male or 4 or more drinks for a female) in the past 2 weeks, and (c) age at having the first drink of alcohol.

In the past 30 days, 58.1% ($N = 64$) of the participants spent more than 3 hours consuming alcohol on one occasion. The mean frequency of having binge drinking was

1.22 ($SD = 1.66$). Excluding the participants who did not have any experience of drinking alcohol ($N = 13$), the average age of having the first alcohol was 16.28 ($SD = 1.94$).

Among all the participants, the overwhelming majority, 98.0 % ($N = 96$), had first drink of alcohol under 21.

Drinking and driving behaviors. Greening and Stoppelbein (2000) examined young drivers' health-relevant attitudes and intentions with respect to drinking and driving. They asked five questions and the present study used the same measures of drinking and driving: (a) the frequency of driving after consuming at least four alcoholic beverages within a 2.5-h time frame (0 = never; 1 = 1-2 times/year; 2 = 3-6 times/year; 3 = once a month; 4 = 2-4 times month; 5 = once a week; 6 = more than once a week), (b) experience of driving a vehicle "after drinking two alcoholic beverages" during the past 12 months (yes/no), (c) experience of driving a vehicle "after a minimum of four alcoholic beverages" during the past 12 months (yes/no), (d) driving a vehicle "while slightly intoxicated" during the past 12 months (yes/no), (e) having "cited or arrested for drunk driving in the past 5 years" (yes/no).

Experience with alcohol-related traffic accidents. To measure the degree of individuals' experience of alcohol-related vehicle accidents, the following measurement items were used; (a) experience of an auto (or motorcycle) accident after drinking (1 = never; 2 = once, a minor accident in which no one was hurt; 3 = once, a serious accident with major damage to vehicles but with no serious injuries to persons; 4 = once, a serious accident with injuries to me or to a passenger[where someone had to go to the emergency room]; 5 = two or more times [where someone had to go to the emergency room]), (b) experience of being a passenger in a vehicle accident (1 = never; 2 = once; 3 = twice or

more), (h) experience of being a passenger in a vehicle accident caused by an intoxicated driver (1 = no; 2 = in once case; 3 = in more than one case), (c) experience of having a friend or personal acquaintance killed or seriously injured in an automobile wreck (yes/no). For more detailed information, participants were asked to write their personal experiences of alcohol-related car accidents. One participant wrote, “Once four of my friends were in a car driving home from a party. The driver was sober but the other passengers were extremely intoxicated. They were distracting him shouting at him to change the song. One of the passengers lived and the rest died.” Another participant said, “My uncle was killed when he was thrown from the car. He was driving while intoxicated. My father has been seriously hurt due to an accident he had while he was intoxicated.” Some participants even wrote the specific dates and the places their friends and family members died in an accident related to drunken driving (ex., the brother of one of my friends was killed by a drunk driver in the August of 2005). Based on the responses, two graduate students rated the participants’ descriptions and produced a composed measure showing the degree of personal history about serious motor accidents to personal acquaintances (1 = no experience; 2 = injured by an accident, but it was not related with alcohol; 3 = died by an accident, but alcohol was not related; 4 = seriously injured due to a drunken driver; 5 = died due to alcohol-related automobile accidents).

3.5.2. Manipulation check for experimental conditions at T1

To determine the effectiveness of three experimental conditions, one question asking the degree of choice of one’s avatar features was measured at T1. Participants responded on a 7-point scale (from 1, *no choice at all* to 7, *lots of choices*), with the higher scores indicating a successful manipulation of the option to customize an avatar.

3.5.3. Validation checks

Post-Experiment Assessment Instrument in session 1 (T1)

Evaluation of activities in SL. After participants completed the first experimental session, five questions were asked to measure how participants felt during the activities in SL at T1: (a) I was confused (reverse coded), (b) I was bored (reverse coded), (c) I liked and enjoyed activities in SL, (d) I cannot understand why people play this game (reverse coded), and (e) I want to play SL more. The rating scale was from 1 to 7 (where 1 = *not at all*, 2 = *slightly*, 3 = *somewhat*, 4 = *moderately*, 5 = *fairly much*, 6 = *very much*, 7 = *extremely*), with higher scores indicating pleasant experiences of the activities in SL.

Post-Experiment Assessment Instrument in session 2 (T2)

Amount of alcohol consumed by the avatar in SL. After participants ended the second experimental session, two questions were asked to check the degree of drinking alcohol at the dance party at T2: (a) number of drinks consumed at the party (1 = none; 2 = 1-3 drinks; 3 = 4-6 drinks; 4 = more than 7 drinks), (b) the kinds of drinks consumed at the party. The responses to the party were measured with one question: (a) having fun at the party (1 = yes; 2 = maybe; 3 = no).

Emotional responses to the vehicle crash in SL. Immediately after the vehicle crash session completed, seven items were used to measure the degree of emotional responses (personal distress) to the car accident and injuries: (a) how serious was the crash? (b) I am very upset about the damage to my avatar, (c) I am very upset about the damage to the other avatar in my vehicle, (d) I am distressed that my avatar's drinking may have caused the wreck, (e) I take responsibility for the crash by my avatar, (f) I feel

guilty that I let my avatar party too much and drink too much, and (g) I am ashamed of myself for letting my avatar get out of control. The response scale was from 1 to 5 (where 1 = *not at all*, 2 = *somewhat*, 3 = *moderately*, 4 = *very much*, 5 = *extremely*), with higher scores indicating more negative emotional responses (distress, sense of guilt, anxiety, shame, blame) to the crash. Internal consistency was high ($\alpha = .90$).

3.5.4 Variables

Avatar ratings for similarity to self, emotional closeness and attractiveness. Each participant made a rating of several dimensions including the degree of similarity to the self, physical attractiveness, and emotional closeness.

McCroskey, Richmond, and Daly (1975) developed the measure of perceived homophily scale, and the studies by Chung (2005) and by Gong (2008) used the following modifications: “My avatar... is like me/is unlike me,” “... is different from me/is similar to me,” “... thinks like me/does not think like me,” and “...does not behave like me/behaves like me.” Chung (2005) used a 5-point scale and Cronbach's alpha was .89. In Gong's study (2008), the responses ranged between 1 and 7, and the measures were highly reliable ($\alpha = .93$). The present study included three items to measure the perceived similarity to self: (a) “my avatar is like me,” (b) “my avatar behaves like me,” and c) “my avatar is different from me (reverse coded).” The responses were measured on a 7-point scale (1 = *not at all*, 2 = *slightly*, 3 = *somewhat*, 4 = *moderately*, 5 = *fairly much*, 6 = *very much*, 7 = *extremely*), with higher scores indicating that participants perceived their avatars to be more similar to themselves. Cronbach's α showed strong internal consistency ($\alpha = .85$ at T1 and $\alpha = .86$ at T2).

Four items were used to measure emotional closeness: (a) "I have strong attachment to my avatar," (b) "my avatar is my representative in Second Life," (c) "I would be very distressed if bad things happen to my avatar in Second Life," and (d) "I would be very pleased if good things happen to my avatar in Second Life." In addition, one slightly revised item from an interpersonal attractive scale by McCroskey and McCain (1974) was added: (e) "I think my avatar can be a friend of mine." All responses ranged from 1 to 7 (1 = *not at all*, 4 = *moderately*, 7 = *extremely*), with the higher scores showing a greater degree of emotional closeness. Cronbach's α of emotional closeness at T1 was .84 and it was .87 at T2.

Three items were used to measure the degree of physical attractiveness. McCroskey and MoCain (1974) developed fifteen items for an interpersonal attraction measure, and Lo (2008) slightly modified it to be used in an online game environment. For the present study, three reworded items from the original measures by McCroskey and MoCain (1974) were used: (a) "my avatar is more attractive than me," (b) "my avatar is ever better looking than I am," and (c) "I think my avatar is quite handsome or pretty." Three items were assessed on a 7-point scale (1 = *not at all*, 4 = *moderately*, 7 = *extremely*), with the higher scores showing that participants viewed their avatars as more attractive. Cronbach's α indicates a strong internal consistency ($\alpha = .90$ at both T1 and T2).

3.5.5 Dependent measures

Behavioral intention to engage in alcohol-impaired driving. Armitage, Norman, and Conner (2002) assessed behavioral intention regarding driving after drinking alcohol. The present study used three slightly modified items from Armitage et al.'s (2002)

original scale. The items were: (a) “I will definitely drive after having several drinks of alcohol,” (b) “I intend to drive after drinking alcohol,” and (c) “I will drink and drive the next time that I am out at a party or bar with friends.” Next, MacDonald, Zanna, and Fong (1995) measured intentions related to drinking and driving, and the present study adopted two items from their measures: (d) “If I only had a short distance to drive home the next time that I am at a party or bar, I would drive while intoxicated,” and (e) “Suppose I drive my friends next time that I go out to a party or bar, and I tell my friends that I will drive them home, I would drive in this situation, even if intoxicated, because I would feel obligated to do so.” All items ranged from 1 to 7 (1 = *not at all*, 2 = *slightly*, 3 = *somewhat*, 4 = *moderately*, 5 = *fairly much*, 6 = *very much*, 7 = *extremely*). Cronbach's α indicates acceptable internal consistency ($\alpha = .82$ at T1 and $\alpha = .83$ at T2). The BI was measured twice, both at T1 ($M = 6.58$, $SD = .75$) and at T2 ($M = 6.66$, $SD = .66$). From these two measures (BI at T1 and BI at T2), I devised a new dependent measure (CBI), which tapped the change in behavioral intention produced as a consequence of participating in the experiment (BI at T2 – BI at T1).

Attributional processes. Three items were used to see who the participants find being responsible for the car accident.: (a) the avatar as being responsible, (b) participants as being responsible, and (c) the experimenter as being responsible. The response to each item ranged between 1 and 5 (1 = *not at all*, 2 = *somewhat*, 3 = *moderately*, 4 = *very much*, 5 = *completely*).

CHAPTER 4

RESULTS

4.1 Manipulation check

On the postexperimental questionnaire used at T1, all participants answered the question assessing how much choice they had with respect to the features and physical characteristics of their avatar (from 1, *no choice at all* to 7, *lots of choices*). As expected, results from a one-way analysis of variance (ANOVA) showed that participants in the choice conditions indicated having greater choice than those in the no-choice condition, $F(1, 109) = 42.29, p < .001$, partial $\eta^2 = .28$, $M_{\text{choice}} = 5.87, SD = 1.32$; $M_{\text{no-choice}} = 3.68, SD = 2.25$, suggesting that the manipulation of the option to customize the avatar was valid.

4.2 Validation checks

4.2.1 The evaluation of activities in SL at T1

At the end of T1, questions were added to check whether or not the evaluation of activities in SL at T1 was different by experimental conditions.

First, I examined the difference in the level of control between choice and no-choice groups. Participants described their feeling about the activities in SL (from 1, *not at all* to 7, *extremely*). Participants said they were a) not confused, $F(1, 109) = .72, p < .40$, $M_{\text{choice}} = 4.82, SD = 1.49$; $M_{\text{no-choice}} = 4.55, SD = 1.75$; b) not bored, $F(1, 109) = .26, p < .61$, $M_{\text{no-choice}} = 5.20, SD = 1.68$; $M_{\text{choice}} = 5.03, SD = 1.72$; c) liked and enjoyed, $F(1, 108) = .51, p < .48$, $M_{\text{no-choice}} = 3.75, SD = 1.66$; $M_{\text{choice}} = 3.53, SD = 1.50$. They also responded that

they d) can understand why people play this game, $F(1, 109) = 1.64, p < .20, M_{\text{no-choice}} = 4.68, SD = 1.83; M_{\text{choice}} = 4.20, SD = 1.92$; e) want to play SL more, $F(1, 108) = .14, p < .70, M_{\text{no-choice}} = 2.90, SD = 1.85; M_{\text{choice}} = 2.77, SD = 1.63$. No significant differences were found. Also, there was no significant difference in the average evaluation of activities in SL, $F(1, 107) = .41, p < .52, M_{\text{no-choice}} = 4.21, SD = 1.36; M_{\text{choice}} = 4.05, SD = 1.22$.

Second, I examined the difference in the level of control between control and no-control groups (no-control group means that participants only had a function to customize their avatars, but did not have an option to control them to participating in various SL activities). Participants said the activities were a) not confused, $F(1, 109) = 1.04, p < .31, M_{\text{no-control}} = 4.97, SD = 1.49; M_{\text{control}} = 4.63, SD = 1.62$; b) not bored, $F(1, 109) = .12, p < .73, M_{\text{control}} = 5.13, SD = 1.69; M_{\text{no-control}} = 5.00, SD = 1.73$; c) liked and enjoyed, $F(1, 108) = .10, p < .76, M_{\text{control}} = 3.64, SD = 1.52; M_{\text{no-control}} = 3.53, SD = 1.68$. They also responded that they d) can understand why people play this game, $F(1, 109) = 1.65, p < .20, M_{\text{control}} = 4.51, SD = 1.91; M_{\text{no-control}} = 4.00, SD = 1.83$; e) want to play SL more, $F(1, 108) = .09, p < .77, M_{\text{control}} = 2.85, SD = 1.73; M_{\text{no-control}} = 2.74, SD = 1.65$. No significant differences were found. The mean evaluation of activities in SL were not different by whether or not participants were directed to control the avatar, $F(1, 107) = .21, p < .64, M_{\text{control}} = 4.15, SD = 1.32; M_{\text{no-control}} = 4.02, SD = 1.15$.

4.2.2. The evaluation of activities at a dance party in SL at T2

Before the car crash, participants experienced a joyful life event, playing at a dance club. Participants were represented as a distinguished, customized avatar (choice group) or as a basic avatar (no choice group). The levels of participation were different;

a) controlling the avatar to dance or drink any beverages (control group); b) simply observing a video clip showing their customized avatar participating in the party (no control group).

A question was added to see whether or not there was any significant difference between experimental groups in terms of the amount of alcohol consumed. There was no significant difference between choice and no-choice groups: $F(1, 109) = .12, p < .73$, $M_{\text{choice}} = 1.87, SD = .33$; $M_{\text{no-choice}} = 1.85, SD = .36$. There was also no difference between control and no-control groups in the amount of alcohol consumed: $F(1, 109) = .25, p < .62$, $M_{\text{control}} = 1.88, SD = .33$; $M_{\text{no-control}} = 1.84, SD = .37$.

Participants also rated whether they had fun at the party (no = 1, maybe = 2, yes = 3). There was no difference between choice and no-choice groups in the degree of emotional excitement at the dance club: $F(1, 108) = 2.11, p < .15$, $M_{\text{choice}} = 2.54, SD = .63$; $M_{\text{no-choice}} = 2.35, SD = .77$. There was also no significant difference between control and no-control groups: $F(1, 109) = .80, p < .37$, $M_{\text{no-control}} = 2.57, SD = .63$; $M_{\text{control}} = 2.44, SD = .69$.

4.2.3. The degree of emotional responses to the car crash at T2

All participants watched a video clip presenting the vehicle accident caused by the avatar's alcohol-impaired driving. In the video, the avatar of each participant drove a car and accidentally hit another car, and that car got on fire. Participants graded their emotional reactions to the crash (from 1, *not at all* to 7, *extremely*), and there was no difference between choice and no-choice groups: $F(1, 107) = .23, p < .63$, $M_{\text{choice}} = 2.33, SD = .94$; $M_{\text{no-choice}} = 2.24, SD = .96$. There was no significant difference between control and no-

control groups either.: $F(1, 107) = .42, p < .52, M_{\text{control}} = 2.33, SD = .94; M_{\text{no-control}} = 2.20, SD = .95$.

4.3. Preliminary analysis

The factor structure of the relationship between the creator and the avatar is presented along with salient loadings above .40 in Table 4.1. The validity of the items was tested using a principal component analysis (PCA) with varimax rotation. PCA is the most commonly used method for extracting factors and confirming that multiple items measure the same factor (Paek, Gunther, McLeod, & Hove, 2011). All items loaded unambiguously on each separate factor. The three-factors emerged included: a) emotional closeness between the creator and the avatar (Factor I), b) physical attractiveness of one's avatar (Factor II), and c) similarity of one's avatar to self (Factor III). Collectively all three factors accounted for about 73.48% of the variance.

Reliability of the scale was estimated by Cronbach's alpha and internal consistency was high and acceptable, ranging from .85 to .90.

Table 4.1 Factor structure of the relationship between the avatar and the creator at T1

Item	Three-factor solutions			
	Alpha	EMO	PHY	SIM
I would be very pleased if good things happened to my avatar in SL	.84	.82		
I think my avatar could be a friend of mine		.77		
I would be very distressed if bad things happened to my avatar in SL		.75		
My avatar is my representative in Second Life		.68		
I have strong attachment to my avatar		.65		
My avatar is more attractive than me	.90		.95	
My avatar is ever better looking than I am			.94	
I think my avatar is quite handsome or pretty			.71	
My avatar is different from me	.85			.91
My avatar is like me				.86
My avatar behaves like me				.74
Eigenvalue		5.18	1.75	1.56

Note1: $N = 111$ college students. EMO = emotional closeness between the creator and the avatar, PHY = physical attractiveness of one's avatar, SIM = similarity of one's avatar to self.

Note2: Only factor loadings greater than .40 are reported for the sake of parsimony.

4.4. Hypothesis tests

The present study attempts to examine what VR conditions would be more effective in terms of producing changes in behavioral intention (CBI). Three experimental conditions were constructed: (a) no having a choice of avatar features but having a control over the activities through the avatar in SL at T1 along with active participation at the dance party at T2 (control-only group), (b) not having a control of

activities but having a choice of avatar features at T1 plus passive observation of the dance party at T2 (choice-only group), and (c) having a choice of avatar features and having a control over avatar's activities at T1 as well as active involvement in the dance party at T2 (choice and control group).

4.4.1 Hypothesis 1

4.4. 1.1. Hypothesis 1a

H1a: Participants who have an option to customize their avatar will consider their avatar to be more similar to themselves than those who are assigned a basic avatar.

H1a predicted that participants would build different degrees of similarity judgment about their avatar by whether or not they were directed to customize their own avatar. To control for previous online experience and demographic factors, an analysis of covariance (ANCOVA) was conducted in which the two experimental conditions were the independent variables and the levels of perceived similarity of one's avatar measured at T1 and at T2 were the dependent variables. The longest time using the Internet, frequency of playing games, duration of playing games in the past 6 months, duration of playing games during the 11th and 12th grades, age, and gender were all entered as covariates.

The difference between choice and no-choice groups in perceived similarity at T1 was significant, $F(1, 102) = 4.21, p < .05$, partial $\eta^2 = .04$, $M_{\text{choice}} = 2.77, SD = 1.63$; $M_{\text{no-choice}} = 2.29, SD = 1.24$. Participants who were directed to customize their own avatar viewed their avatar more similar to themselves than those who were assigned to select one of twelve basic, complete avatars provided in SL at no cost. The difference in the similarity perception between choice and no-choice groups was also significant at T2.

Participants with a personalized avatar were more likely to believe that their avatars looked similar to themselves compared to participants with a basic avatar: $F(1, 101) = 5.09, p < .01$, partial $\eta^2 = .05$. H1a was supported both at T1 and T2.

4.4. 1.2 Hypothesis 1b

H1b: Participants who have an option to customize their avatar will consider their avatar to be more emotionally close to themselves than those who are assigned a basic avatar.

H1b proposed that the degrees of emotional closeness with one's avatar would be different depending upon whether or not participants were allowed to customize the avatar.

At T1, participants who customized their own avatar considered their avatar as more emotionally close to themselves ($M = 2.33, SD = 1.22$) than those who were assigned the basic avatar at T1, ($M = 1.85, SD = 1.04$), $F(1, 102) = 4.86, p < .01$, partial $\eta^2 = .05$. At T2, participants with their personalized avatar were again more likely to perceive the emotional closeness with their avatars ($M = 2.15, SD = 1.34$) than those with the basic avatar ($M = 1.67, SD = 0.71$), $F(1, 98) = 7.41, p < .01$, partial $\eta^2 = .07$. H1b was supported by these findings.

4.4. 1.3. Hypothesis 1c

H1c: Participants who have an option to control their avatar will consider their avatar to be more similar to themselves than those who are directed simply to observe.

H1c examines whether the level of perceived similarity is a function of whether or not participants have an option to control the activities of their avatars. There was no difference between control and no-control groups in perceived similarity at T1: $F(1, 62) = 1.81, p < .18$, partial $\eta^2 = .03$, $M_{\text{no-control}} = 2.63, SD = 1.57$; $M_{\text{control}} = 2.29, SD = 1.24$. The

difference was not significant at T2 either, regardless of whether participant had no-control ($M = 2.38, SD = 1.32$) or control ($M = 2.36, SD = 1.25$): $F(1, 62) = 0.60, p < .46$, partial $\eta^2 = .01$. H1c was not supported in this study.

4.4. 1.4 Hypothesis 1d

H1d: Participants who have an option to control their avatar will consider their avatar to be more emotionally close to themselves than those who are directed simply to observe.

H1d proposed that the degrees of emotional closeness with one's avatar would be different depending upon whether or not participants were allowed to control their avatars. Contrary to what was hypothesized, perceived emotional closeness at T1 was higher in the no-control condition ($M = 2.53, SD = 1.25$) than the control condition ($M = 1.81, SD = .94$), $F(1, 61) = 7.14, p < .01$, partial $\eta^2 = .11$. At T2, the degree of emotional closeness was also higher in the no-control condition ($M = 2.12, SD = 1.29$) than the control condition ($M = 1.67, SD = .60$), $F(1, 61) = 5.96, p < .05$, partial $\eta^2 = .09$. H1d is not supported; findings were counter-hypothetical.

4.4.2 Hypothesis 2

H2: Participants who have an option to customize their avatar will view their avatar more physically attractive than those are assigned to a basic avatar.

H2 predicted that participants who were allowed to customize their own avatar would view their avatars more physically attractive than those who were assigned to a basic avatar. As expected, at T1, participants with a customized avatar ($M = 3.02, SD = 1.79$) indicated a higher degree of perceived attractiveness than those who used a basic avatar ($M = 2.03, SD = 1.08$), $F(1, 62) = 9.29, p < .01$, partial $\eta^2 = .13$. The attractiveness evaluation was also higher at T2 in the choice group ($M = 2.44, SD = 1.47$) than the no-

choice group ($M = 1.68$, $SD = .87$), $F(1, 59) = 10.48$, $p < .01$, partial $\eta^2 = .15$. These findings supported H2.

4.4.3 Hypothesis 3 & RQ1 & RQ2

H3 predicted that participants would show more positive and greater changes in behavioral intentions (CBI) with respect of driving under the influence of alcohol when they perceived a higher degree of relationship with their avatars. The level of relationship was measured on three dimensions: (a) similarity to self, (b) emotional closeness, and (c) physical attractiveness. Simple correlations were used to test the associations between the variables.

4.4. 3.1. Hypothesis 3a

H3a: The more participants find their avatars similar to themselves, the more likely they intend to change behaviors positively.

H3a proposed a positive relationship between the similarity judgment of the avatar and CBI. Similarity judgment at T1 was not related to CBI, $r = .06$, $p < .54$ (Table 4.2). But at T2, CBI was positively associated with similarity judgment, $r = .22$, $p < .05$. H3a was only partially supported.

4.4. 3.2. Hypothesis 3b

H3b. The more participants find their avatars emotionally close to themselves, the more likely they intend to change behaviors positively.

H3b expected that emotional closeness with an avatar would be positively related with CBI. Emotional closeness at T1 was positively associated with CBI, $r = .21$, $p < .05$. But, this relationship was not significant at T2, $r = .12$, $p < .23$. H3b was partially supported.

4.4. 3.3. Hypothesis 3c

H3c. The more participants find their avatars physically attractive, the more likely they intend to change behaviors positively.

H3c predicted that participants who found their avatar more attractive would show greater CBI. Physical attractiveness at T1 was not significantly related to CBI, $r = .09$, $p < .33$. At T2, there was a positive relationship between participants' view of their avatar's physical appearances and CBI, but it was not significant, $r = .17$, $p < .08$.

There were only partial support for H3a and H3b and no support for H3c. In the following analyses, the association between the perceived relationship (similarity, emotional closeness, attractiveness) and CBI will be examined for the choice and control group, for choice-only group, and for the control-only group separately.

4.4. 3.4. Choice and control condition: Relationship with one's avatar and CBI

First, in the choice and control condition, similarity judgment at T1 was positively associated with CBI, but the relationship was not statistically significant, $r = .28$, $p < .10$ (see Table 4.2). But at T2, the relationship between similarity judgment and CBI was statistically significant, $r = .34$, $p < .05$. Emotional closeness both at T1 and at T2 was all positively related to CBI, $r = .47$, $p < .01$; $r = .38$, $p < .05$. Evaluation of physical appearances at T1 and at T2 was also positively related to CBI, $r = .39$, $p < .05$; $r = .43$, $p < .01$. After experiencing the car crash in a virtual world, participants who interacted with their customized avatar seemed to change their BI positively when they found their avatars similar and emotionally close to themselves, and viewed their avatars physically attractive.

4.4. 3.5. Choice-only condition: Relationship with one's avatar and CBI

Second, in the choice-only condition, CBI was only positively related with similarity judgment at T2, $r = .37, p < .05$. CBI was not related with similarity judgment at T1, emotional closeness at T1 and at T2, $r = -.20, p = .27$; $r = -.11, p = .44$; $r = .09, p = .63$. Physical attractiveness at T1 and at T2 were not associated with CBI, $r = -.17, p = .36$; $r = -.15, p = .42$. These findings show that perceived relationship is largely unrelated with CBI among those in the choice-only group.

4.4. 3.6. Control-only condition: Relationship with one's avatar and CBI

Lastly, in the control-only condition, CBI was not associated with similarity judgment at T1 and at T2, $r = -.13, p = .42$; $r = .23, p = .17$. Emotional closeness at T1 and at T2 were not related to CBI, $r = .03, p = .84$; $r = .01, p = .95$. There was also no statistically significant relationship between CBI and emotional closeness at T1 and at T2, $r = .10, p = .58$; $r = -.07, p = .68$. CBI was not related with physical attractiveness at T1 and at T2, $r = -.02, p = .90$; $r = -.06, p = .73$. Again, perceived relationship was largely unrelated with CBI among those in the control-only condition. It seems that the perceived relationship is related with CBI only when participants are allowed to customize and control the avatar (the choice and control condition).

Participants who are allowed to customize and control their avatars seem to perceive a close relationship (H1a – H1d) with their avatars, and this close relationship seems to produce a greater change in behavioral intention.

Table 4.2 shows the zero-order Pearson correlation analysis between the degree of relationship with one's avatar and CBI.

Table 4.2 Correlations between the degree of relationship with avatar and CBI

Variables	All participants	Choice & Control	Choice	Control
1. Similarity T1	.06	.28	-.20	-.13
2. Similarity T2	.22*	.34*	.37*	.23
3. Emotion T1	.21*	.47*	-.11	.03
4. Emotion T2	.12	.38*	.09	.01
5. Attractiveness T1	.09	.39*	-.17	-.02
6. Attractiveness T2	.17	.43**	-.15	-.06

Note: $N = 111$ college students. Similarity = similarity of one's avatar to self; Emotion = emotional closeness between the creator and the avatar; Attractiveness = physical attractiveness of one's avatar; CBI = changes in behavioral intentions.

* $p < .05$; ** $p < .01$; *** $p < .001$.

4.4. 3.7. RQ1

RQ1. To what degree will changes in behavioral intentions be a function of one's prior use of alcohol and one's experience with alcohol-related accidents?

RQ1 investigates the possible influence of previous experiences both with alcohol and with alcohol-related traffic accidents on CBI with respect to alcohol-impaired driving (Table 4.3). Participants' degree of experience of driving after at least four alcoholic beverages within a 2.5-h time frame (ALCOHOL-4) was positively related to CBI: $r = .20, p < .05$. Being a passenger in an alcohol-related traffic accident (PASSENGER) and the experience of having a friend or personal acquaintance related to an automobile wreck (minor accident, major damage, seriously injured, or killed) caused by a drunken driver (DDRIVER) were all positively associated with CBI: $r = .21, p < .05$; $r = .20, p < .05$. Age at having the first drink of alcohol (DAGE), hours spent consuming the maximum number of drinks (DHOURS) and times of having binge drinking (TDRINKS),

and the experience of driving after drinking during the past 12 months (while slightly intoxicated/ two alcoholic beverages/ four alcoholic beverages) (TDD) were not significantly related to CBI, $r = .11, p < .28$; $r = -.14, p < .14$; $r = -.12, p < .20$; $r = .07, p < .45$.

In additional analyses, the correlation between previous experiences and CBI was examined in each of the three experimental groups (choice and control, choice only, and control only) separately (see Table 3).

In the choice-only condition, there were no statistically significant relationships between CBI and DAGE, DHOURS, TDRINKS, ALCOHOL-4, TDD, PASSENGER, and DDRIVER: $r = .09, p < .61$; $r = .13, p < .49$; $r = -.18, p < .33$; $r = -.21, p < .27$; $r = -.11, p < .56$; $r = -.17, p < .36$; $r = -.10, p < .59$.

In the control-only condition, CBI was negatively related to DHOURS and TDRINKS, $r = -.38, p < .05$; $r = -.35, p < .05$, indicating that the more a person drinks, the less likely he or she is to change behavioral intention. There was a positive relationship between CBI and PASSENGER: $r = .36, p < .05$. DAGE, ALCOHOL-4, ADD, and DDRIVER were not significantly related with CBI: $r = -.21, p < .19$; $r = -.17, p < .36$; $r = -.10, p < .59$. Participants who spent less time on drinking alcohol and had a small number of binge drinking were more likely to show positive CBI. Those who had a negative experience of being a passenger in a motor accident were also more likely to show a positive CBI.

In the choice and control condition, DAGE, ALCOHOL-4, TDD, and DDRIVER were all positively related with CBI: $r = .33, p < .05$; $r = .40, p < .05$; $r = .37, p < .05$; $r = .46, p < .01$. PASSENGER was marginally related with CBI: $r = .29, p < .09$. CBI was not

associated with DHOURLS and TDRINKS, $r = -.08, p < .65$; $r = .13, p < .45$. Interestingly, participants who started drinking alcohol early and those who were willing to drive after drinking showed more positive changes. It seems that the previous experiences played the largest role among the participants in the choice and control group.

Table 4.3 Correlations between alcohol-related variables and CBI

Variables	All participants	Choice & Control	Choice	Control
1. DAGE	.11	.33*	.09	-.21
2. DHOURLS	-.14	-.08	.13	-.38*
3. TDRINKS	-.12	.13	-.18	-.35*
4. ALCOHOL-4	.20*	.40*	-.21	-.17
5. TDD	.07	.37*	-.11	.01
6. PASSENGER	.21*	.29	-.17	.36*
7. DDRIIVER	.20*	.46**	-.10	-.10

Note: $N = 111$ college students. DAGE = age at having the first drink of alcohol; DHOURLS = hours spent consuming the maximum number of drinks; TDRINKS = times of having binge drinking; ALCOHOL-4 = experience of driving after at least four alcoholic beverages; TDD = experience of driving after drinking during the past 12 months; PASSENGER = being a passenger in an alcohol-related traffic accident; DDRIIVER = experience with an automobile wreck; CBI = changes in behavioral intentions.

* $p < .05$; ** $p < .01$; *** $p < .001$.

4.4. 3.8. RQ2

RQ2. Will one's prior use of alcohol and experiences with alcohol-related accidents be related with the perceived relationships with his or her own avatar?

RQ2 examines how participants' real-life experiences with alcohol and driving are related with the relationships with their avatar (similarity, emotional closeness,

attractiveness) after observing a car accident due to alcohol-impaired driving (see Table 4.4).

In the choice and control condition, DAGE was positively related with similarity judgment at T2 and emotional closeness at T1, $r = .34, p < .05$; $r = .34, p < .05$. DAGE was marginally associated with emotional closeness at T2, $r = .30, p < .07$. There was a positive relationship between emotional closeness at T2 and TDRINKS, ALCOHOL-4, and TDD: $r = .33, p < .05$; $r = .36, p < .05$; $r = .48, p < .01$ (Table 4). The result of RQ1 shows that participants who started alcohol drinking at an earlier age and those who had an experience of driving under the influence of alcohol are more likely to show a greater CBI. How could this happen? One possible explanation would be that participants who viewed their avatar as similar and emotional close to themselves were more likely to change their BI positively after experiencing a wreck caused by a drunken driver. The alcohol-involved accident happened in a virtual world, but participants who built a higher level of relationship with their avatars viewed the accident more serious and would think that the crash could happen to them in a real life. This mediation effect may lead them to respond that they were less likely to drive under the influence of alcohol.

Table 4.4 Correlations between alcohol-related variables and the degree of relationship with avatar in choice and control condition

Variables	Similarity T1	ST2	Emotion T1	ET2	Attractiveness T1	AT2
1. DAGE	.29	.34*	.34*	.30	.20	.26
2. DHOURLS	.06	.04	.15	.25	-.08	.04
3. TDRINKS	.09	.18	.19	.33*	-.01	-.05
4. ALCOHOL-4	.10	.22	.18	.36*	.15	.14
5. TDD	.12	.26	.21	.48*	.19	.25
6. PASSENGER	-.04	.05	-.16	-.11	-.33	-.12
7. DDRIIVER	.01	.18	.24	.19	-.05	.04

Note: $N = 111$ college students. DAGE = age at having the first drink of alcohol; DHOURLS = hours spent consuming the maximum number of drinks; TDRINKS = times of having binge drinking; ALCOHOL-4 = experience of driving after at least four alcoholic beverages; TDD = experience of driving after drinking during the past 12 months; PASSENGER = being a passenger in an alcohol-related traffic accident; DDRIIVER = experience with an automobile wreck; Similarity = similarity of one's avatar to self; Emotion = emotional closeness between the creator and the avatar; Attractiveness = physical attractiveness of one's avatar

* $p < .05$; ** $p < .01$; *** $p < .001$.

In the choice-only condition, similarity judgment at T2 was positively related to DAGE and DHOURLS: $r = .35, p < .05$; $r = .44, p < .05$ (Table 4.5). Participants who started drinking alcohol early and spent more time on consuming alcohol viewed their avatar more similar to themselves. However, unlike in the choice and control condition, DAGE and DHOURLS were not related to CBI.

Table 4.5 Correlations between alcohol-related variables and the degree of relationship with avatar in choice-only condition

Variables	Similarity T1	ST2	Emotion T1	ET2	Attractiveness T1	AT2
1. DAGE	0.4	.35*	-.08	-.05	.17	.05
2. DHOURLS	.16	.44*	-.02	.16	.20	.15
3. TDRINKS	-.06	.20	.05	.06	.18	.17
4. ALCOHOL-4	-.12	.26	.08	.21	.29	.12
5. TDD	-.09	.22	-.02	-.05	.06	-.07
6. PASSENGER	-.25	.06	-.05	.21	-.01	-.08
7. DDRIIVER	.13	.25	.21	.23	.13	.19

Note: $N = 111$ college students. DAGE = age at having the first drink of alcohol; DHOURLS = hours spent consuming the maximum number of drinks; TDRINKS = times of having binge drinking; ALCOHOL-4 = experience of driving after at least four alcoholic beverages; TDD = experience of driving after drinking during the past 12 months; PASSENGER = being a passenger in an alcohol-related traffic accident; DDRIIVER = experience with an automobile wreck; Similarity = similarity of one's avatar to self; Emotion = emotional closeness between the creator and the avatar; Attractiveness = physical attractiveness of one's avatar

* $p < .05$; ** $p < .01$; *** $p < .001$.

In the control-only condition, DDRIIVER was positively related to similarity judgment at T2: $r = .32$, $p < .05$ (Table 4.6). Participants who had tragic experiences with a car accident would perceive their avatar similar to themselves after the accident at T2.

Table 4.6 Correlations between alcohol-related variables and the degree of relationship with avatar in control-only condition

Variables	Similarity T1	ST2	Emotion T1	ET2	Attractiveness T1	AT2
1. DAGE	-.16	-.26	.10	.11	-.10	.01
2. DHOURLS	-.02	.05	-.07	.04	-.28	.08
3. TDRINKS	.11	-.06	-.07	-.10	-.03	.03
4. ALCOHOL-4	.23	.18	.25	.07	.01	.16
5. TDD	-.04	-.03	-.05	-.07	.03	.11
6. PASSENGER	-.10	.20	.11	.12	.11	.24
7. DDRIIVER	.07	.32*	.20	.25	.02	.26

Note: $N = 111$ college students. DAGE = age at having the first drink of alcohol; DHOURLS = hours spent consuming the maximum number of drinks; TDRINKS = times of having binge drinking; ALCOHOL-4 = experience of driving after at least four alcoholic beverages; TDD = experience of driving after drinking during the past 12 months; PASSENGER = being a passenger in an alcohol-related traffic accident; DDRIIVER = experience with an automobile wreck; Similarity = similarity of one's avatar to self; Emotion = emotional closeness between the creator and the avatar; Attractiveness = physical attractiveness of one's avatar

* $p < .05$; ** $p < .01$; *** $p < .001$.

4.4.4 Hypothesis 4

4.4.4.1 Hypothesis 4a

H4a: Participants who have an option to customize their avatars will indicate a greater intention to change behaviors more positively than those who are assigned to a basic avatar.

H4a predicted that participants with a personalized avatar would be more likely to change BI positively than those with a basic avatar. An analysis of covariance (ANCOVA) was conducted in which the two experimental conditions (choice vs. no-choice condition) were the independent variables and CBI was the dependent variables. The longest time using the Internet, frequency of playing games, duration of playing

games in the past 6 months, duration of playing games during the 11th and 12th grades, age, and gender were all entered as covariates. There was no statistically significant difference in CBI, $F(1, 95) = .04, p < .84$, partial $\eta^2 = .00$, $M_{\text{choice}} = .05, SD = .59$; $M_{\text{no-choice}} = .04, SD = .43$. CBI was not changed by whether participants were directed to customize their avatar.

4.4. 4.2. Hypothesis 4b

H4b: Participants who have an option to control their avatars will indicate a greater intention to change behaviors more positively than those who are directed to simply observe.

An analysis of covariance (ANCOVA) was conducted in which the two experimental conditions (control vs. no-control condition) were the independent variable and CBI was the dependent variables. The longest time using the Internet, frequency of playing games, duration of playing games in the past 6 months, duration of playing games during the 11th and 12th grades, age, and gender were all entered as covariates. The degree of CBI was not changed by whether participants had a control over the avatar's activities ($M = .07, SD = .59$) or had no control ($M = .01, SD = .40$), $F(1, 95) = .25, p < .62$, partial $\eta^2 = .003$.

4.4.5 Hypothesis 5 & RQ3

4.4. 5.1. Hypothesis 5a

H5a. Participants who have an option to customize their avatars will be more likely to attribute responsibility to themselves than those who are assigned to a basic avatar.

H5a predicted that participants would perceive a greater responsibility for the vehicle crash when they had an option to customize their avatar. An analysis of

covariance (ANCOVA) was conducted in which the two experimental conditions (choice vs. no-choice condition) were the independent variable and the attribution of responsibility was the dependent variables. The longest time using the Internet, frequency of playing games, duration of playing games in the past 6 months, duration of playing games during the 11th and 12th grades, age, and gender were all entered as covariates. There was no difference between choice and no-choice in the degree of feeling responsible for the accident: $F(1, 101) = .13, p < .72$, partial $\eta^2 = .001$, $M_{\text{no-choice}} = 2.35$, $SD = 1.51$, $M_{\text{choice}} = 2.17$, $SD = 1.37$. Therefore, H5a was not supported.

4.4. 5.2. Hypothesis 5b

H5b. Participants who have an option to control their avatars will be more likely to attribute responsibility to themselves than those who are directed to simply observe.

H5b predicted that participants would feel more responsible for the crash when they had an option to control their avatar. An analysis of covariance (ANCOVA) was conducted in which the two experimental conditions (control vs. no-control condition) were the independent variable and attribution of responsibility was the dependent variables. The longest time using the Internet, frequency of playing games, duration of playing games in the past 6 months, duration of playing games during the 11th and 12th grades, age, and gender were all entered as covariates. Participants who enjoyed SL by controlling their avatar were more likely to attribute the responsibility to themselves ($M = 2.41$, $SD = 1.50$) than those who observed a video clip ($M = 1.80$, $SD = 1.09$), $F(1, 101) = 4.01, p < .05$, partial $\eta^2 = .04$. Participants who experienced the virtual world by operating their avatars were more likely to consider themselves as being responsible for the crash. Therefore, H5b was supported. The frequency of playing video games and

gender (female) were statistically significant covariates, $F(1, 101) = 8.90, p < .01$, partial $\eta^2 = .08$; $F(1, 101) = 5.53, p < .05$, partial $\eta^2 = .05$.

4.4. 5.3. RQ3

RQ3. How participants' perceived relationship with avatars is related with taking responsibility for the consequences of avatars' actions?

RQ3 tested how the relationship with one's avatar is related with the attribution of responsibility by looking at each experimental condition separately (Table 4.7).

Attributional processes were measured in three aspects; (a) a tendency to attribute the responsibility to the avatar (ATT1), (b) a tendency to attribute responsibility to the participants themselves (ATT2), and (c) a tendency to attribute the responsibility to the experimenter (ATT3).

In the choice and control group, emotional closeness at T2 was positively related to ATT2 (see Table 7), while it was negatively linked to ATT3, $r = .42_{ATT2}, p < .01$; $r_{ATT3} = -.33, p < .05$. That is, the participants who were emotionally close to their avatar were more likely to consider themselves as being responsible for the crash, while those who were emotionally distant to their avatar were more likely to perceive the crash as a fault of the experimenter. In addition, emotional closeness at T2 was marginally related to ATT1, $r = .29, p < .08$. The relationship between similarity at T2 and ATT1 was marginally significant, $r = .29, p < .07$. Participants who were more emotionally close to their avatars and viewed their avatar more similar to themselves tended to perceive their avatar as being responsible for the crash.

In the choice-only condition, there was a positive relationship between physical attractiveness at T2 and ATT2 $r = .53, p < .01$. Participants were more likely to attribute the responsibility to themselves when they found the avatars physically more attractive..

No statistically significant relationships between attributional processes and the degree of relationships with one's avatar were found in the control-only condition.

Table 4.7 Correlations between the degree of relationship with avatar and attributional processes

Variables	All participants	Choice & Control	Choice	Control
1. Similarity T2: ATT1	.004	.29	-.20	-.08
2. Similarity T2: ATT2	.03	.06	.13	-.17
3. Similarity T2: ATT3	-.02	-.23	-.24	.25
4. Emotion T2: ATT1	.21*	.29	.25	.09
5. Emotion T2: ATT2	.25**	.42**	.24	.08
6. Emotion T2: ATT3	-.06	-.33*	.05	.11
7. Attractiveness T2: ATT1	.04	-.10	.32	-.11
8. Attractiveness T2: ATT2	.23*	.18	.53**	.14
9. Attractiveness T2: ATT3	-.005	-.15	.005	.11

Note: $N = 111$ college students. Similarity = similarity of one's avatar to self; Emotion = emotional closeness between the creator and the avatar; Attractiveness = physical attractiveness of one's avatar; ATT1: tendency to attribute the crash to an avatar; ATT2: tendency to attribute the crash to themselves; ATT3: tendency to blame the crash to an experimenter; Attribution = attributional processes of the vehicle crash.

* $p < .05$; ** $p < .01$; *** $p < .001$.

4.5. Further analysis

4.5.1 Relationship with one's avatar and emotional reactions to the crash

Because the alcohol-related traffic accident caused by a drunken driver happened in a virtual world, it was important to examine how participants respond to the crash and

how the degree of relationship with one's avatar can affect the degree of emotional reactions to the crash (ERC).

In the choice and control condition, ERC was positively related with emotional closeness at T2: $r = .56, p < .001$ (Table 4.8). Participants who were emotionally close to their avatars took the crash more seriously although it happened in a cyberworld.

In the choice-only condition, ERC was positively related with the ratings of emotional closeness at T2: $r = .40, p < .05$. In addition, ERC was positively linked to the ratings of physical attractiveness at T2: $r = .59, p < .001$. Participants who identified their avatar as close to themselves and found their avatars attractive were more likely to emotionally react to the accident.

In the control-only condition, there was a marginally significant relationship between emotional closeness at T2 and ERC, $r = .29, p < .08$. Similarity at T2 and attractiveness at T2 were not related with ERC: $r_{\text{similarity}} = .05, p < .76$; $r_{\text{attractiveness}} = .22, p < .18$.

Table 4.8 Correlations between the degree of relationships with avatar and ERC

Variables	All participants	Choice & Control	Choice	Control
1. Similarity T2	.16	.17	.20	.05
2. Emotion T2	.41***	.56***	.40*	.29
3. Attractiveness T2	.32***	.16	.59***	.22

Note: $N = 111$ college students. Similarity = similarity of one's avatar to self; Emotion = emotional closeness between the creator and the avatar; Attractiveness = physical attractiveness of one's avatar; ERC = emotional reaction to the crash.

* $p < .05$; ** $p < .01$; *** $p < .001$.

4.4. 6.2. Emotional reaction to the crash and attributional processes

The relationships between ERC and attributional processes were examined. In all conditions, there was a significant correlation between ERC and attributing responsibility to participants themselves (ATT2): $r_{\text{choice\&control}} = .73, p < .001$; $r_{\text{choiceonly}} = .66, p < .001$; $r_{\text{controlonly}} = .39, p < .05$ (Table 4.9). In the choice and control condition and choice-only condition, participants who expressed emotional reactions to the accident in SL were more likely to find their avatars being responsible for the crash (ATT1): $r_{\text{choice\&control}} = .40, p < .05$; $r_{\text{choiceonly}} = .55, p < .001$. In the control-only condition, ATT1 had a marginally significant relationship with ERC, $r_{\text{controlonly}} = .31, p < .06$. Overall, participants who felt distressed about the crash blamed their avatar and themselves for the accident.

Table 4.9 Correlations between ERC and attributional processes

Variables	All participants	Choice & Control	Choice	Control
1. ATT1	.39***	.40*	.55***	.31
2. ATT2	.60***	.73***	.66***	.44**
3. ATT3	.06	-.23	.25	.16

Note: $N = 111$ college students. ATT1: tendency to attribute the crash to an avatar; ATT2: tendency to attribute the crash to themselves; ATT3: tendency to blame the crash to an experimenter; Attribution = attributional processes of the vehicle crash.

* $p < .05$; ** $p < .01$; *** $p < .001$.

CHAPTER 5

DISCUSSION

The present study proposes a practical suggestion that will potentially reduce alcohol-related risk behaviors by exposing young college students to negative consequences of heavy alcohol drinking and driving (i.e., vehicle crash) in the context of an alternative virtual world—Second Life. The “identification” theory within developmental-social psychology has explained how individuals develop their self-identity and suggested two key variables, choice and control, which can lead to strong identification. The “Proteus Effect” in communication also suggests the importance of a chance to be represented in a better visual image in the virtual world. Scholars have shown the effect of having different degrees of interactions with avatars on promoting healthy behavior changes. The present study examined the three dimensions of perceived relationship with one’s avatar: (a) similarity to self, (b) emotional closeness, and (c) physical attractiveness. Participants in this study were randomly assigned to one of three different experimental conditions: (a) no choice of avatar features and control over the activities through the avatar in SL at T1 along with active participation at the dance party at T2 (control-only group), (b) no control of activities and choice of avatar features at T1 plus passive observation of the dance party at T2 (choice-only group), and (c) choice of avatar features and active participation in Second Life’s menu of activities at T1 as well as active participation in the dance party at T2 (choice and control group).

First, the degree of perceived similarity was affected by the experimental conditions (choice vs. no-choice). At T1, participants who were allowed to customize their own avatar viewed their avatar more similar to themselves than those who were assigned to select one of twelve basic, non-customizable avatars provided in SL at no cost. Similarity judgment among the participants with personalized avatars was also higher than those with the basic avatars at T2. The result may indicate that a higher degree of perceived similarity can be formed when a person has an option to create their own unique, personalized avatar in the virtual world. In the control-only condition, participants operated several functional keys to enjoy the freedom of activities in SL, but it was not enough to build a higher similarity perception about their avatar compared to the choice condition. For this reason, the similarity judgment was not affected by whether or not participants had a control over the avatar's activities.

The degree of emotional closeness was also higher at both T1 and T2 in the choice condition, where participants customized their own avatars than in the no-choice condition where participants were assigned to a basic avatar.. During the first session (T1), participants without having an option to control the avatar's activities were directed to create their avatar (the choice-only condition). Then, they observed a video clip of someone else's controlling the avatar in SL. They were informed to think that the avatar they were watching in the video could be their character and pretend that they were in SL and participated in the activities like the avatar in the video did. Participants in this condition had an opportunity to express their personality by creating their own virtual representations and by choosing unlimited avatar-related items. If they did not like the look, they could just change it without facing any obstructions or constraints. In the

process of finding preferred items, they might concentrate on what they wanted to be, and seeing their personalized avatar by their selections might increase the degree of emotional closeness, compared to those who only controlled the basic avatar.

Difference in the degree of emotional closeness was also found at T2. In the second session, participants with their customized avatar were not actively engaged in the SL dance party (the choice only condition), but not having an option to control did not affect emotional closeness. They only watched a pre-recorded video with their personalized avatar performing dynamic dance moves on the sparkling floor and enjoying the club. On the other hand, participants with the basic avatars were actively involved with the party, but their visual form was not noticeable in the crowd. The dance clubs in SL were designed for social gathering, and SL users visit these places to show off how many items they own and how virtually skillful they are. Those who were represented in an uncharacteristic avatar might feel more emotional distance at T2 because every SL user knows that their characters are given from SL for free of charge. This may also explain why there was a significant relationship between having an option to choose and the perceived emotional closeness.

The evaluation of the avatar's physical attractiveness was higher among those who customized their avatar compared to those who controlled the basic avatar both at T1 and at T2. Participants who were only focused on creating their avatar might view their avatar more attractive after putting creatively designed outfits on their avatar than those who did not have a chance to demonstrate their personality into their avatar's external look. During the experiment, I observed that a lot of participants were attentive to even small, trivial parts like a headband, a hat or a necklace. One male participant visited

several shopping malls to find perfect shoes matching his formal black suit. Female participants were more likely to adjust the size of their avatar's face, breast, and arms. Even though the body of their avatar could be transformed automatically by trying a specially designed avatar-body item, many of female participants used several function keys to modify their avatar's lip fullness, nose shape, length of arms, etc. It took some time to get familiar with how to customize their avatars in SL but once they figured it out, they were not hesitant. I observed one female participant who immediately changed her avatar's hairstyle from simple, dark-brown bobbed hair into light-golden brown pinned curls with the side of the crystal tiara headband. To match with this prom-styled hair, she directly ran into the dress shop to take off her plain blue denim. Throughout the experiment, she kept changing her avatar's looks and after the experiment, she thanked me for giving her this fun time and asked how to find more avatar outfits.

Now we know that having an option to choose can enhance perceived relationship with the avatar. Then, how does the perceived relationship relate to the participants' behavioral intentions in terms of drinking and driving? I focus on discussing the association between the degrees of relationship with the avatar and the change in behavioral intentions (CBI) by looking at each condition separately.

First, in the choice and control condition, participants who viewed their avatars more similar to themselves showed positive changes. A higher degree of emotional closeness with their avatar both at T1 and at T2 also led to positive CBI. Car accidents can happen any times and any circumstances. It does not matter how much drivers are skillful or cautious. We should avoid of driving under the influence of alcohol, but sometimes negative life-events could happen to us. Just as accidents can occur any time

in real life, the car crash due to a drunken driver happened in SL. Those who find their avatar similar to and emotionally close to themselves seem to find such a small gap between the virtual world and the real world, and thus become more likely to change their behavioral intentions to avoid of facing a tragic accident due to drinking alcohol. In this condition, positive view about the avatar's physical looks influenced CBI both at T1 and at T2. Participants showed more positive CBI when they considered their avatars more physically attractive than even themselves in real life. The "Proteus Effect" demonstrated that users who were assigned to control a better visual form were more likely to act confident and assertive on the table for negotiation than those were assigned a less attractive avatar. Kim and Sundar (2012) also showed that SL users who customized their avatar to representing their ideal images were more likely to engage in health preventive behaviors (e.g., not smoking or not drinking). In the present study, participants who had a chance to create a better version of them viewed their customized avatar very attractive. After the enjoyable dance party, through the video they observed their attractive avatar was involved with the tragic car accident due to alcohol. Probably those who viewed their avatar more attractive did not like to see the negative harms to their avatar. Therefore, they were more likely not to drive under the influence of alcohol.

In the choice-only condition, a higher degree of similarity judgment at T2 was only positively related to CBI. Participants created their own avatars, but experienced the party by simply observing their personalized avatar. Then they viewed the negative harms to their customized avatar. Those who viewed their avatar similar to themselves would draw a link between their avatar and themselves. They may find that the possibility of

negative consequences of alcohol-impaired can be real, and become more likely to change their behavioral intention.

Lastly, in the control-only condition, CBI was not associated with any relationships with the avatar. When a chance to be represented as a personalized avatar was not given, participants had the lowest relationship with their avatar and the impact of negative consequences to the avatar was not strong enough to change their negative behaviors.

Contrary to what was hypothesized, there was no direct correlation between having an option to customize avatars (choice vs. co-choice) and CBI. Neither was a significant direct correlation between having an option to control (control vs. no-control). Therefore, neither having an option to customize one's avatar nor having an option to control the avatar seems to have a "direct" influence on the changes in behavioral intention. Nonetheless, it is important to point out that the option to customize one's avatar may have an indirect effect on CBI through the mediation of perceived similarity and emotional closeness. I found that having an option to customize own avatar was positively associated with perceived similarity and emotional closeness, which in turn were positive correlated with the change in behavioral intention. When developing a virtual reality program designed to promote healthy behaviors, it seems to be important and necessary to include a feature that allows participants to customize their own avatars.

Peng (2008) demonstrated that the degree of relationship with the character mediated the association between the experience mode (active participation vs. observation) and the degree of engaging in healthy behaviors. In his study, players who controlled their avatar were more likely to identify themselves with the avatar and this

higher degree of identification with the avatar increased one's willingness to engage in healthy eating behaviors. This finding is consistent with the findings reported in this study. I found that giving an option to customize participants' avatars leads them to perceive greater similarity and emotional closeness to themselves, and that these two measures of perceived relationship with the avatar were positively associated with the change in behavioral intention.

In this study, I also examined how previous experiences with alcohol and driving and with alcohol-related traffic accidents were related with CBI. In addition, I examined how participants' previous experiences with alcohol and driving were related with the perceived relationship with their avatars.

In the choice and control condition, participants who had certain experiences relevant to alcohol and driving showed positive CBI and their previous alcohol and driving experiences were positively related to the degree of relationship with their avatars. Participants who started drinking alcoholic beverage early (DAGE) were less likely to attempt drunken driving. This finding can be explained by looking at the changes in the perceived relationship with the avatars. After observing the accident at T2, participants who drank first alcoholic beverage at their early age viewed their avatars more similar to themselves than T1. DAGE was positively related to emotional closeness at T1, and it was positively, though marginally, associated with emotional closeness at T2. Many researchers have shown that teenagers with early access to alcohol are more likely to engage in risky driving and drinking and driving (Bina, Graziano, & Bonino, 2006; Copeland, Shope, & Waller, 1996; Van Beurden, Zask, Brooks, & Dight, 2005). Even having friends who started drinking alcohol early is related to teenagers' dangerous

driving (Lang, Waller, & Shope, 1996). Probably those with early onset of drinking would perceive that the accident in SL could be occurred in the real life when they viewed their avatars similarly resembled themselves, and reduced the emotional distance from their avatars.

Blomeyer and her colleagues (2011) contended that early age at first drink would affect later heavy drinking under stressful life events in young adults. They emphasized that the prevention program raising age at first contact with alcohol should be considered. The issue related to legal drinking age is controversial and a group of college and university presidents and the NIAAA College Drinking Take Force are still debating (Nelson et al., 2010).

The present study suggested that after experiencing the accident in SL, early drinkers were more likely not to drive under the influence of alcohol when they viewed their avatar more similar and emotionally close to themselves after they created their avatars and controlled them for fun activities in SL. This study showed that a new concept using virtual reality programs in health-relevant campaigns for young college students might be effective to positively changing behavioral intentions in terms of driving after drinking. The practical approach applying this idea to changing behavioral intentions of persons who started drinking alcohol at early age is needed.

In the choice-only condition, participants' judgment of similarity at T2 was positively related with DAGE and DHOURLS (hours spent consuming the maximum number of drinks). That is, those who had early access to alcohol and spent more times on consuming alcohol formed grater perceived similarity at T2 although they simply

observed their personalized avatar enjoying the dance party through the video. However, participants' previous experiences with alcohol and driving were not related to CBI.

Lastly, in the control-only condition, DDRIIVER (experience of having a friend or personal acquaintance related to an automobile wreck caused by a drunken driver) was positively related with similarity judgment at T2. Participants participated in the dance party as an active member and observed the crash caused by their avatar. Those with a previous experience of having a friend or a personal acquaintance related to an automobile wreck might find their avatars more similar to themselves. Participants' experience of being a passenger in alcohol-related traffic accidents (PASSENGER) was also positively related to CBI. DHOOURS and TDRINKS (frequency of binge drinking) were negatively related to CBI. Participants' healthy drinking behaviors and their negative experience with a motor accident caused by an intoxicated driver increased positive CBI. The accident in SL might lead participants to remember the tragic consequences of alcohol-impaired driving and the importance of healthy drinking and driving behaviors. In this condition, CBI was more closely related with participants' previous experience than with the perceived relationships with the avatars.

In the present study, participants observed the negative consequences of alcohol-impaired driving and it was examined how they felt responsible for the accident. I found different attributions of responsibility from different experimental conditions. Participants who controlled their avatar to perform various activities at T1 and vigorously participated in the dance party (control-only group) were more likely to find themselves responsible than those who customized their avatar at T1 and observed the video showing their personalized avatar enjoying the party at T2 (choice-only group)., indicating that giving

an option to control the avatar can lead the participants to feel greater personal responsibility for negative consequences.

How did participants' degrees of relationships with their avatars affect the attribution of responsibility?

In the choice and control condition, the degree of emotional closeness at T2 was positively related to ATT2 (tendency to attribute the crash to themselves), while it was negatively linked to ATT3 (tendency to blame the crash to an experimenter). That is, participants who found their avatars more emotionally close to themselves tended to find themselves more responsible for the crash. On the other hand, those who were more emotionally detached from their avatars were more likely to perceive that the accident was a fault of the experimenter. Bowman and his colleagues (2012) showed that pro-social online game playing (i.e., interacting with other users and maintaining the relationships) had a higher degree of attachment to their avatars and took a higher degree of responsibility. In the choice and control condition, participants enjoyed a social event, dance party. Participants experienced this fun activity by controlling their customized avatars. This might lead them to take greater responsibility for the accident.

In the choice-only condition, the degree of physical attractiveness was positively related to ATT2. At T2, participants were asked to merely watch a video clip that showed their avatars enjoying the dance party. They might pay more considerable attention to the external looks of their avatars and their positive view might be taken in the important position to take a higher responsibility.

In the control-only condition, attributional processes were not related to any of relationship with the avatars.

Lastly I examined how the attributional process was related with participants' emotional responses to the alcohol-related traffic accident. In all conditions, participants who were upset and distressed about the negative consequences from the wreck were more likely to find their avatars and themselves. Even though the accident occurred in the virtual world and they merely watched the video, participants who felt personal loss by the accident would take more responsibility.

5.1 Limitations and implications for future research

This study has many limitations in terms of its substance as well as the methods used. This study investigated virtual interactions in Second Life, a rich and complicated virtual world, and there are several limitations in this regard. One limitation in investigating a complex, realistic environment is that it is extremely difficult to have a complete control over potential confounding variables even when the study is carried out in a strictly controlled laboratory experiment. Although the final design of this study was developed after a series of pilot tests, the design has several limitations, which may account for the lack of significant support for some of the hypotheses tested. I had to be particularly careful when measuring two types of background variables that might be relevant to this study. The first variable was one's previous experiences with using the Internet and playing games that involved avatars. Second, I assessed participants' previous experiences with drinking alcohol and with alcohol-related car accidents.

Related to the vehicle crash, the more participants had played VR programs, the more likely they were to take the responsibility for the accident in SL. Participants who came to the laboratory and played with Second Life all had different experiences of using the Internet and virtual games and different levels of familiarity to VEs. Future research

needs to examine how one's previous experiences can affect the extent to which VR games can increase one's intention to make behavioral changes, which in turn will provide important implications in terms of designing the VR program for people with different level of previous experiences with VR games.

This study has relatively small number of male participants (94 females, 17 males). It is therefore likely that the generalizability of the findings is somewhat limited. It is important to point out that some of the key findings of this study can be more or less relevant to females than males. For example, female participants tended to find their avatars more attractive. Female participants also seemed to find the party more enjoyable than male participants. Females were also more likely than males to find themselves responsible and change their behavioral intentions. Compared to female college students, the rate of excessive alcohol consumption by male students had continually increased and they took more alcohol-related risk behaviors (e.g., driving under the influence of any alcohol and taking the same car with an intoxicated driver) (Beck et al., 2010). In this study, female participants viewed their avatars more physically attractive, and had more enjoyable time at the alcohol-involved dance party. It was more likely to lead positive CBI and greater responsibility for the accident. However, the percentage of male participants was too small (15.3%). Many ideas were suggested to increase the rate of male college students, and more male students participated in the study compared to the pilot tests. By providing monetary incentives, future research may be able to recruit more male students allowing gender effect to be examined. Future research based on the current findings need to use a more represent sample, with the key demographic variables being adequately represented.

Methodological strengths and limitations. Many participants were not quite familiar with Second Life, so they watched a short video clip to see how to play SL and what SL users can do. The video was prepared to help participants become familiar with SL, but it is also possible that the video somehow affected participants' perceptions even before they participate in the experiment. In addition, participants were given a fully explained instruction before the experiment starts. First, the trained instructor observed whether participants follow the instruction. Then, an individual lesson about how to adjust the avatar's body and wear clothes or perform the activities (e.g., skiing and surfing) was given to each participant. The SL places for creating the avatar or enjoying the activities were carefully chosen to ensure many participants can follow and have fun. To some participants, SL seemed the excited place providing fantastic activities (e.g., riding a whale or flying). But some participants found it little unrealistic or boring or complicated. There is a possibility that these prep procedures might have affected the effects of the SL game in one way or another.

The dance party scenario was chosen after reviewing many possible stories which could easily happen both in the real world and in the virtual world. The club was also carefully selected as a realistic representation of the circumstance of drinking alcoholic beverages. Because of the tight time limits, the place which only focused on dancing, drinking, listening music and socialized was chosen. Participants who expected more activities and larger fun might find the setting quite generic and boring, which in turn might affect the extent to which participating in the SL game could increase one's intention to change behavior.

The video clip showing the tragic vehicle crash was carefully produced based on the pre-determined motor wreck story (i.e., the participant's avatar was driving a car and a same-gender person who was at the dance party sat in the passenger seat. The avatar's car hit another car on the road and this car instantly was on fire). Because of some technical problem, in the video, minor difference like some distance between the two cars occurred. In addition, it is also a limitation that only one version of car wreck was used in the experiment. Future study may need to use several different versions of an accident with different levels of seriousness, and examine how seriousness of the accident can affect the extent to which playing a VR game can increase one's intention to change risky behaviors.

Testing Effects. In testing the effects of having an option to choose (and customize) and having an option to control, I compared three experimental groups: Choice and Control, Choice-only, and Control-only groups. One limitation of this study was that there was no “true” control group, where the participants were not allowed either to choose or control the avatar (no-choice and no-control group). At the first session (T1), participants in the choice-only group spent about 20 “interesting” minutes to customize their avatars, and then spent 20 “boring” minutes on simply watching what the avatars did in SL without controlling the avatars. Participants in the control-only group, on the other hand, spent about 20 “boring” minutes on simply watching another person customizing his or her avatar, and then spent 20 “interesting” minutes to control their avatars to participating in various SL activities. I did not want to have the “true” control group because the participants in the no-choice and no-control group would do nothing and spend 40 “boring” minutes at T1. In addition, the second session (T2) was conducted in

two phases separate by approximately one week. After spending 40 “boring” minutes, the retuning rate of the no-choice and no-control group might be low because this group had to spend another 20 “boring” minutes on watching what the avatars did at the party. Despite potential benefits of having a true control group, I decided not to have one because of the practical reason.

5.2 Implications of the study

Heavy alcohol consumption by college students is a persistent social problem and it has a number of detrimental consequences, such as fights, poor academic performances, alcohol abuse and dependence (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2008). Among the alcohol-related issues, driving under the influence of alcohol is one of the most dangerous problems compared to other concerns related to alcohol consumption on college campuses (Wechsler & Nelson, 2008; White & Hingson, 2014).

School-based education and prevention programs have been implemented but studies have shown that educational prevention and intervention programs are not always effective in reducing excessive alcohol use and related problems among college students (Foxcroft & Tsertsvadze, 2011; Jones et al., 2007; Kanof, 2003; Lynam et al., 1999; Nelson et al., 2010; Zernike, 2001).

Using virtual reality (VR) technologies in health and medical promotion has extended our understanding of cognitive and behavioral changes and shown some successful results (Cho et al., 2008; Fox & Bailenson, 2009; Kim & Davis, 2009b; Kim & Sundar, 2012; Peng, 2008; Yee & Bailenson, 2007; Yee, Bailenson, & Ducheneaut, 2009). Various VR conditions have been used to promote healthy behaviors, but the

dynamic mechanisms in which the virtual environments (VEs) can function effectively is still little known.

The present study is designed to enhance our understanding of using VEs technologies as a way to help college students engage in preventive behaviors and make changes in behavioral intentions (CBI) in terms of driving while intoxicated.

The major contribution of this study is to bring together research ideas from social-development psychology and communication research to gain a better understanding of the conditions under which VR technology can more effectively function to affect CBI and perceived responsibility. The identification theory explained how individuals could develop their self-identity and suggested two key variables that can affect the extent to which VR users identify themselves with their virtual representations (avatars): choice and control. Through different degrees of interactions with avatars (such as having an option to choose and customize own avatars and an option to control them), users can build different degrees of relationship with their avatars, which in turn can lead to different levels of success. From the communication perspective, the Proteus Effect explained the importance of physical attractiveness of avatars and how the attractiveness can affect one's intention to make changes in behaviors.

Using VEs in promoting preventive behaviors can be effective particularly among young adults. Playing online VR games and interacting with other players in the games seem to be an important part of social life among young adults. At the same time, however, there has been growing concern about the youths' excessive game uses and other resulting problems typically found on the Internet (Kim and Davis, 2009a). Considerable attention had given to underage gamers' addition problem, and it triggered

strict regulation. In 2011, South Korea, having the most advanced online game markets and cultures, introduced the “Shutdown Law,” also called as the “Cinderella Law,” banned accesses of those under the age of 16 from midnight to 6 a.m. (Lee, 2011). The government implemented this new system to prevent teenagers’ problematic game uses and reduce parents’ concerns. However, furious opposition from game developers and civil rights advocates is continued. They ask the effectiveness of this system since teenagers could use accounts of their parents or relative adults. They also criticize this law for “excessive probation.” Due to this system, a 15-year-old professional gamer, who was internationally well-known for his game skills, lost in the semi-final of an online game tournament, “2012 StarCraft II World Championship,” with prize of approximately \$30,000 (Lee, 2012). In 2011 two lawsuits filed and the Constitutional Court is still reviewed the constitutionality of the Shutdown Law (Park & Kim, 2014). In 2013, even more heated proposal was proposed by the ruling party members, treating games as one of the four major sources of addiction, along with alcohol, drugs and gambling (Choi, 2013). While negative harms of game addiction to teenagers are focused, another perspective related to online games is presented. In the United States, the Supreme Court rejected California law that banned the sale of violent video games to children (Liptak, 2011). Justices were more concerned the importance of keeping creative development on First Amendment grounds.

Controversial debates about problematic online game uses of teenagers are still intense and different views seem to be incompatible. It is obviously true that our society should look at the negative impacts of excessive game uses. However, simultaneously our

focus should be also given to searching for various ways of using advanced 3D VEs technologies in multiple areas.

Related to the significant life-event, raising a baby, we face two different stories. As a tragic accident, a South Korean couple addicted to 3D online game let their three-month-old daughter to die from neglect (Salmon, 2010). Ironically, they were obsessed playing online role-playing game, Prius Online that involved raising a virtual character of a young girl. In the court, the mother said she had no education about baby care at the hospital and from the books. For her or other parents who are not prepared for an unborn child, “Born-to-be-Alive,” 3D interactive VE program is developed (PRWeb, 2013). This unique immersive technology invites a user to experience the different steps of fertility and childbirth. It is tested with mothers, and their responses to the program were positive and enthusiastic (Cap Digital, 2013).

VEs technologies have also used to reducing severe pain of soldiers which combat-related burn injuries. Those who suffered the highest burn pain and were distracted by playing VR program (e.g., shooting snowballs at mammoths) had a higher degree of pain reduction (Maani et al., 2011). This approach is also used to reduce intense Phantom pain (Ortiz-Catalan et al., 2014). The volunteer took various methods, but nothing was effective until he participated in the experiment, constructing a representation of his amputee on a screen. He could control his virtual arm through signals from his damaged limb stump that he had not been able to use for decades. After playing games by using his computerized arm, the intense pain, which made him to wake up at numerous nights, gradually reduced. In those studies, one condition, engaging in the game as an active member by controlling the character on the screen, was given to the

patients, and the results were outstanding. Followed those positive outcomes, recent program developers emphasize how much sensor technology is advanced to feel better augmented virtual condition or how realistic the computerized images are.

Under what conditions, can use of VR games be more effective in helping users engage in preventive behaviors, particularly in the context of drunken driving? I first found that giving an option to choose and customize users' own avatars would be important. Although having an option to choose and customize did not show a direct influence on one's intention to change behaviors, I found that having the option significantly increased perceived similarity, emotional closeness, and physical attractiveness of the users' avatars, which in turn were related with increased intention to change behaviors. That is, having an option to choose and customize own avatar can influence, at least indirectly, one's intention to engage in preventive behaviors or change unhealthy behaviors. Having an option to choose and customize own avatar may enhance the emotional tie with the avatar, and when something negative happens to the avatar (i.e., a car accident), the users seem to take the negative consequence more personally, and the negative consequence seems to become a significant motive for the users to change their problematic behaviors.

In a similar context, I found that giving an option to control the avatar would be important as well. Although having this option was largely unrelated with users' intention to change behaviors, it did have an impact on the way the users attribute responsibility. Compared to those who simply watched what their avatars did, the participants who were allowed to actively control their avatars were more likely to find themselves responsible for the negative consequence (a car accident), which in turn might affect their intention to

change behaviors. It is less likely for a person to change his or her behavior as a result of witnessing a negative event, as far as the person attributes the responsibility to somebody else. Those who had an option to control their avatars seem to take greater responsibility for what happened to the avatars, and we believe that this perceived responsibility can become an important motive for the users to change a problematic behavior.

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APPENDIX A: INFORMED CONSENT

Welcome!

The information below explains your rights as a participant in this research.

This study is being conducted by Hokyung Kim as part of her dissertation research. She is a doctoral candidate in the School of Journalism and Mass Communications at University of South Carolina, and her academic supervisor is Dr. Ran Wei, a Head of the Advertising and Public Relations Sequence.

Explanation of procedures: The purpose of this study is to explore how college students use 3-D virtual worlds and how its use relates to their college life. This study has two sessions.

In the first session, you will play or watch Second Life (a 3D virtual game) while seated at an individual computer in the computer lab located in Carolina Coliseum for 30 minutes. Depending on the group that you are randomly assigned to, you may be asked to create your own virtual character and participate in various virtual activities (such as surfing, skiing, and shopping, attending parties), or you may be asked to watch videos of virtual interactions and activities of a virtual character. You will also watch an instructional video clip about Second Life and its characters. Additionally, you will be asked to answer some survey questions about your internet usage, your previous usage of virtual worlds, your drinking and driving behaviors, and your thoughts and impressions about the virtual character you played or observed during the study session. The entire session will take approximately 50 minutes.

The second study session will take place in the same computer lab one week later. In the second session, you will either play Second Life and attend a party as a character, or watch a video clip of a virtual party in Second Life for 15 minutes. Then, you will watch a video clip of a public service announcement. Finally, you will be asked to complete a 5 minute survey asking your thoughts about the Second Life character you observed or played during the second study session. The second session is anticipated to last 20 minutes.

Benefits: The expected benefit of this study is a better social understanding of whether virtual worlds impact real world social issues. Through this study, you will experience a new communication technology and may become more familiar with online worlds. Some participants, at the discretion of the course instructor, may receive a small amount of extra credit in a course you are taking. You will only receive extra credit if you

complete the bulk of the study or an additional assignment agreed upon by your course instructor.

Risks and Discomforts: The research should not put you at any unusual physical or psychological risk. You may feel uncomfortable when you are asked to report your thoughts and experiences. Your participation in this study is completely voluntary. While we hope you will answer each question to the best of your ability, you are not required to answer any question and may stop taking the survey at any time without consequence.

Confidentiality: Your privacy is important. Only the principal investigator will have access to data that includes both your personal ID and your responses to the survey questions. The data will be password protected and your name will be removed from the data file as soon as data collection is complete. Despite these protections, a slight risk of breach of confidentiality remains.

Questions: Questions about participants' right as research subjects should be directed to Thomas Coggins, Director of the USC Office of Research Compliance (803-777-7095, tcoggins@mailbox.sc.edu). Any questions concerning the research project itself should be directed to Ms. Hokyung Kim, Kim65@mailbox.sc.edu (tel. 803.777.9620), or Dr. Ran Wei, ran.wei@sc.edu (tel.803.777.5762).

Thank you.

Please sign below to indicate that you've read the material above and agree to participate in this study.

I have read and understand the statements above. _____
Signature of Participant

APPENDIX B: DEBRIEFING FORM

We appreciate the time you devoted to participating in this study. However, there was some information about the study that we were not able to discuss with you prior to the study, because doing so would have impacted your actions and thus biased the study results. We would like to explain these things to you now.

In this study, we were interested in understanding the emotional relationship between online game users and their game characters. Based on prior research, we expect to find that the degree of emotional closeness between game users and their characters affected game users' behaviors in real life. Studies by Stanford University researchers showed that virtual world program users who played more physically attractive game characters were more emotionally close to their characters and acted more effectively at conference meetings both in the game world and in the real world than those who played less physically attractive characters. Social psychology theories also suggest that the level of participation with objects affects the degree of closeness to the objects. For this reason, we designed three different conditions; a) choices to create a customized and personal character and control through the character in the virtual world, b) no choice and control, and c) choice and no control. You were randomly assigned to one of these conditions before you played the Second Life program.

Through this experiment, we were trying to examine the changes in behavioral intentions to drive after drinking. Annual reports show that driving under the influence of alcohol is the most serious cause of death to college students. We anticipate that the amount of control you had in creating your avatar will impact your feelings about the car accident your character was involved in after the dance party. This study was designed to investigate the impact of the virtual world programs to real life events. We thought that the dancing party and driving after drinking scenario would be common to most college students.

We hope that this clarifies the purpose of the research, and the reason we could not tell you all of the details about the study prior to your participation. It is very important that you do not discuss this study with anyone else until the study is complete. Our efforts will be greatly compromised if participants come into this study knowing what it is about and how the ideas are being tested.

You can remove your Second Life account or play it if you want to. It is your choice.

If you have any questions or concerns, you may contact Ms. Hokyung Kim at (803) 777 – 9620 or Kim65@mailbox.sc.edu. Thank you again for your participation.

APPENDIX C: QUESTIONNAIRE OF SESSION1

The following questions deal with **how you use virtual worlds and how its use fits into your college life**. Please check the number that best applies to you.

1. What is the longest time you have spent using the Internet in a day?

- ☐ Less than half an hour in a day ☐ 1/2 to 1 hour a day
☐ 1 - 3 hours in a day ☐ 3 - 5 hours in a day
☐ 5 – 7 hours in a day ☐ More than 7 hours in a day
☐ Never

There are many virtual world programs, and here are some examples:

1. World of Warcraft	2. Playstation 3 Home	3. Active Worlds	4. MTV's Virtual Worlds	5. Maid Marian	6. Free Realms
7. The Palace	8. Final Fantasy	9. Store	10. Second Life	11. There	12. Kaneva
13. IMVU	14. Cybertown	15. The Sims	16. Everquest	17. Moove	18. Lineage

2. Have you ever played any of these program(s)?

- ☐ No, I don't play virtual world programs and don't have any experience.
☐ Yes

If "Yes" in Q2, please drag the program(s) you played to the right (click the programs and move to the right).

Items	Move the program(s) you played here
1. World of Warcraft 2. Active Worlds 3. Second Life 4. The Palace 5. IMVU 6. Store 7. Playstation 3 Home 8. Final Fantasy 9. Free Realms 10. The Sims 11. There 12. Kaneva 13. MTV's Virtual Worlds 14. Maid Marian 15. Cybertown 16. Everquest 17. Moove 18. Lineage	

3. Did you play other programs? If so, please write the name(s) of the program(s) you played. _____

Rarely Occasionally Often

←-----→

1 2 3 4 5 6 7

2. During the past 12 months . . .

have you driven a vehicle "after drinking two alcoholic beverages?" ☐ Yes ☐ No

have you driven a vehicle "after a minimum of four alcoholic beverages?" ☐ Yes ☐ No

have you driven a vehicle "while slightly intoxicated?" ☐ Yes ☐ No

have you been "cited or arrested for drunk driving in the past 5 years?" ☐ Yes ☐ No

Please check the number that best applies to you.

4. Have you ever had an auto (or motorcycle) accident when driving after drinking?

☐ Never

☐ Once, a minor accident in which no one was hurt

☐ Once, a serious accident with major damage to vehicles but with no serious injuries to persons

☐ Once, a serious accident with injuries to me or to a passenger [where someone had to go to the emergency room]

☐ Two or more times [where someone had to go to the emergency room]

5. Have you ever been a passenger in a vehicle accident?

☐ Never

☐ Once

☐ Twice or more

6. If "YES to being a passenger in an accident," was the driver of the vehicle someone who had been drinking before the accident?

☐ No

☐ In one case

☐ In more than one case

7. Have you had a friend or personal acquaintance killed or serious injured in an automobile wreck?

☐ No

☐ If yes, please describe the circumstances briefly:

STOP

You've finished "Session 1-1" completely.

Now it's time to experience Second Life!

Follow the next step described in the instruction.

Do not close this site.

**When you've done SL activities, you are asked to
complete the remaining survey.**

**Please do NOT turn to the next
page
until instructed to do so.**

☐ When you've done SL activities, check this button to answer the survey.

Please circle the number that best applies to you.

1. I have strong attachment to my avatar. 1 2 3 4 5 6 7

3. I would be very distressed if bad things happened to my avatar in Second Life.

5. I think my avatar could be a friend of mine.

Not at all Slightly Somewhat Moderately Fairly much Very much Extremely

1	2	3	4	5	6	7
1	2	3	4	5	6	7

2. I intend to drive after drinking alcohol. 1 2 3 4 5 6 7

4. If I only had a short distance to drive home the next time that I am at a party or bar, I would drive after having several drinks of alcohol.

126

Finally, some demographic questions.

1. What is your age?

Age _____

2. What is your gender?

_____ Male _____ Female

3. Year in school:

_____ Freshman

_____ Sophomore

_____ Junior

_____ Senior

_____ Graduate student

4. What racial or ethnic group(s) do you most closely identify yourself with?

_____ African American

_____ Asian/Asian-American

_____ Caucasian/White

_____ Hispanic/Latino/Chicano

_____ Native American

_____ Mixed Race

_____ Other (Please specify _____)

5. Do you have a driver license (for vehicle or motorcycle)?

_____ Yes

_____ No

_____ Does Not Apply

6. Whose 201 class are you in?

_____ Prof. McGinnis

_____ Prof. Wiggins

Debriefing

It is very important that you do not that discuss this study with anyone else until the study is complete. Our efforts will be greatly compromised if participants come into this study knowing what it is about and how the ideas are being tested.

Thank you for your time!

APPENDIX D: QUESTIONNAIRE OF SESSION2

Did you have fun?

Now this party is over.

There is another party you are invited.

We pick a random driver for driving a vehicle to move that party.

When you press a “enter” key below, our random program will tell you whose avatar is chosen to be a “driver.”

_____ Click “enter”

Your avatar has been chosen to drive a vehicle.

Ellen came because it was her birthday, and she had a very good time.

Did you meet “Ellen” at the party?

She was dancing on the dance floor.

She had a lot of fun at the party; she drank somewhat more than she normally does.

She wants to go another party!

Would you invite her to ride along with you?

_____ Yes

STOP

Now you're going to watch a video clip.

When you're done, please continue the survey.

Please do NOT close this site.

☐ I watched the video clip.

Q. Have you played Second Life since Session 1 (after you played SL in session 1)?

a. Yes, if "Yes," how many hours did you play Second Life? _____

b. No

We want to know more about your experience in Second Life. Please tell us...

1. Did your avatar have fun at the party?

_____ Yes

_____ Maybe

_____ No

—

2. How many drink(s) did your avatar have at the party?

_____ None

_____ 1 - 3 drinks

_____ 4 - 6 drinks

_____ More than 7 drinks

3. What kind of drink(s) did your avatar have at the party?

Please drag drink(s) your avatar had at the party to the right.

Items

1. **Margarita**

2. **Cocktail**

3. **Shot**

4. **Whiskey**

5. **Wine**

6. **Soda**

7. **Vodka**

8. **Coffee**

9. **Martini**

10. **Beer**

Move drink(s) over here

4. Did your avatar have different drink(s)? Please write:

The following statements deal with how you think about your avatar in Second Life.

Not at all Slightly Somewhat Moderately Fairly much Very much Extremely



1 2 3 4 5 6 7

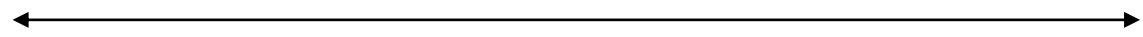
1. My avatar is like me. 1 2 3 4 5 6 7

2. My avatar behaves like me 1 2 3 4 5 6 7

3. My avatar is different from me. 1 2 3 4 5 6 7

The following statements are concerned with how you view your avatar in Second Life.

Not at all Slightly Somewhat Moderately Fairly much Very much Extremely



1 2 3 4 5 6 7

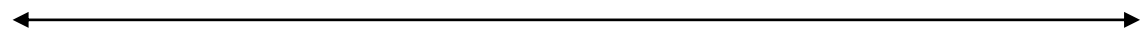
1. My avatar is more attractive than me. 1 2 3 4 5 6 7

2. My avatar is ever better looking than I am. 1 2 3 4 5 6 7

3. I think my avatar is quite handsome or pretty. 1 2 3 4 5 6 7

The following statements deal with how you feel about your avatar in Second Life.

Not at all Slightly Somewhat Moderately Fairly much Very much Extremely



1 2 3 4 5 6 7

1. I have strong attachment to my avatar. 1 2 3 4 5 6 7


2. My avatar is my representative in Second Life. 1 2 3 4 5 6 7

3. I would be very distressed if bad things happened to my avatar in Second Life. 1 2 3 4 5 6 7


4. I would be very pleased if good things happened to my avatar in Second Life. 1 2 3 4 5 6 7

5. I think my avatar could be a friend of mine. 1 2 3 4 5 6 7

The following questions deal with **how you think about the vehicle crash in Second Life.**

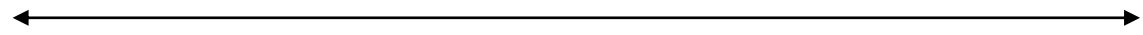
	Not at all	Slightly	Somewhat	Moderately	Fairly much	Very much	Extremely			
										
	1	2	3	4	5	6	7			
1. How serious was the crash?				1	2	3	4	5	6	7
2. I am very upset about the damage to my avatar.				1	2	3	4	5	6	7
3. I am very upset about the damage to the other avatar in my vehicle.				1	2	3	4	5	6	7
4. I am distressed that my avatar's drinking may have caused the wreck.				1	2	3	4	5	6	7
5. I take responsibility for the crash by my avatar.				1	2	3	4	5	6	7
6. I feel guilty that I let my avatar party too much and drink too much.				1	2	3	4	5	6	7
7. I am ashamed of myself for letting my avatar get out of control.				1	2	3	4	5	6	7

Please let us know more about **how you feel about the vehicle crash in Second Life:**

	Not at all	Slightly	Somewhat	Moderately	Fairly much	Very much	Extremely
							
	1	2	3	4	5	6	7
1. To what extent do you see your avatar as responsible for the crash?	1	2	3	4	5	6	7
2. To what extent do you see yourself as responsible for the crash in Second Life?	1	2	3	4	5	6	7
3. To what extent do you see the crash as the fault of the experimenter in Second Life?	1	2	3	4	5	6	7

Please rate the degree to which each of the following statements is true of your party behaviors.

Not at all Slightly Somewhat Moderately Fairly much Very much Extremely



1 2 3 4 5 6 7

1. I will definitely drive after having several drinks of alcohol 1 2 3 4 5 6 7

2. I intend to drive after drinking alcohol. 1 2 3 4 5 6 7

3. I will drink and drive the next time that I am out at a party or bar with friends. 1 2 3 4 5 6 7

4. If I only had a short distance to drive home the next time that I am at a party or bar, I would drive after having several drinks of alcohol. 1 2 3 4 5 6 7

5. Suppose I drive my friends the next time that I go out to a party or bar, and I tell my friends that I will drive them home, I would drive in this situation, even if intoxicated, because I would feel obligated to do so. 1 2 3 4 5 6 7

Debriefing

It is very important you do not discuss this study with anyone else until the study is complete. Our efforts will be greatly compromised if participants come into this study knowing what it is about and how the ideas are being tested.

The brief explanation about the study will be given to the students when the data collection is completed.

I hope you had good experience in Second Life.

Your privacy is very important.

Now, no one will NEVER ask your Second Life information and never will I.

You can remove your account or play SL if you want to. It is all up to you.

Thank you for your time!