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The Elaboration Likelihood Model and Sport Video Gaming Effects on Gamers' Confidence and Desire to Play the Sport

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Abstract

Sport video gamers, as a huge population, have been studied descriptively in terms of the demographic and motivation for playing. Yet most studies paid attention to the relationship between gamers and the video game. A gap remains between sport video gaming and its effects on gamers' attitude toward the exact sport they are playing in the game. Through the Elaboration Likelihood Model lens, the current study aimed to examine the effects of sport video gaming on gamers' confidence in the sport as well as desire to play the sport. A pretest-posttest experimental design was conducted to investigate the causality between gaming and confidence and desire change. As the first application of ELM to sport video game, the current study incorporated the classic route shift pattern in persuasion to predict the improvement of gamers' confidence and desire after game playing. This study proved that sport video gaming is effective in improving gamers' attitude and behavior toward the specific sport. Specifically, this study justified that the time of playing, the performance in game, and the immersive degree of the game are influential to the improvement of gamers' confidence in their ability and knowledge in golf as well as their desire to play golf in real life.

The Elaboration Likelihood Model and Effects of Sport Video Gaming on Gamers' Confidence and Desire to Play the Sport

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TABLE OF CONTENT

LIST OF ILLUSTRATIVE MATERIALS

Chapter 1: Introduction

Sport video game is one of the major and most profitable branches of video game market. In 2013, 59% of Americans play video games with the average age of 30; Consumers spent $21.53 billion on video games, hardware and accessories. Among all the video games, sport games (16%), action games (21%) and shooter games (25%) are the top 3 best-selling genre (Entertainment Software Association, n.d.). Unlike placing gamers in thousands of zombies and highly arousal shooting scenes with tanks and cannons as their competitors do, sport games create a more realistic virtual environment that based on people's perception of daily accessible events. Meantime, sport games allow gamers to achieve goals that won't be compromised by their physical ability and skills in real life (Sherry, Lucas, Greenberg, & Lanchlan, 2006). Thus, sport video games can be considered as the combination of life experience and video game fantasy.

Sport video gamers have been extensively studied in terms of their demography, motivation for playing, game enjoyment as well as attitude change toward in-game advertisements and brands (Alhabash, Wise, 2012; Yee, Bailenson, & Ducheneaut, 2009). However, for a video game consists of both game fantasy and life reality of the sport, little research has touched the sport video gaming's influence on gamers' relationship with the sport.

Borrowing the Elaboration Likelihood Model of persuasion and attitude change, this study explored to what extent does sport video game playing influence gamers' confidence in the sport as well as the desire to play the sport in real life. Substantive studies have been conducted on the psychological effects of video games especially on how does video game violence desensitize real life violence and advocate aggressive behaviors among adolescent gamers (Carnagey, Anderson, & Bushman, 2007; Gentile, Lynch, Linder, & Walsh, 2004; Bartholow, Bushman, &

Sestir, 2006; Murphy, 2009), providing evidence for the substantial existence of psychological effect of video games.

Recent studies paid more attention to the gamers' cognitive process of gaming experience, specifically how do gamers get motivation and satisfaction, and furthermore the awareness of media content inside the game such as advertisements and brands (Walsh, Clavio, Mullane, & Whisenant, 2012; Cianfrone, Zhang, & Ko, 2011; Przybylski, Deci, Rigby & Ryan, 2014). More importantly, video games have attracted sports medicine researchers and health communication scholars' attention by the potential on both mental and physical disease treatment including cardiac problems and dementia (Blanc, Freyssin, Riviere, Mourot, Benaich, Boussuges, & Maunier, 2011; Yamaguchi, Maki, & Takahashi, 2011). All these studies are providing firm theoretical basis for examining the effect of sport video game playing on gamers' personal cognition, attitude as well as their behavior in real life.

Sport Video Gamers

Sherry et al. (2006) applied Uses and Gratification Theory in video game to investigate gamers' game use and preference. They found that unlike other media forms like television and films, gamers always have a highly specified gratification seeking since the cost of game playing is much higher than other media. Besides, social learning patterns are not applicable in games since the top factors for gamers to play are competition, entertainment, and diversion from reality. Learning is not an intentional gratification sought by gamers. This indicates that through the playing of sport games, gamers are not intentionally choosing role models to learn what they should do as social learning process suggests (Bandura, 1994). Instead, the media content inside the video game plays a role as "accessories" for the major motivations of the playing. For sport

games specifically, it implies that the sport itself may not be taken into gamers' purposeful attention compared to the joy and excitement brought by the game.

However, Cianfrone et al. (2011) has pointed out that aside from the key factors of arousal and challenge brought by Sherry et al (2006), team identification of sport games also takes a very important part of gamers' consumption of sport games. The study about brand awareness in video games (Walsh, Clavio, Mullane, & Whisenant, 2012) suggests that the recall and recognition of brands appeared in the game is generated significantly by the playing, while the attitude towards those brands remain almost the same. One implication of this is that the "accessories" in video games, though not taken purposefully as gaming core information, may also have an impact on gamers' perception and corresponding attitude of the sport.

The Elaboration Likelihood Model

Through the lens of Elaborate Likelihood Model (ELM) (Petty, & Cacioppo, 1986), if we consider the sport game playing as a persuasion process between the media content in the game and gamers, the way gamers process sport related content seems to fall into the peripheral route of the ELM since the sport content is not their major motivation to play the game (Petty et al, 1986). Accordingly, this implies only an unstable and weak attitude change. However, past game research suggests that game enjoyment can have a very strong influence on gamers' attitude change that are strong enough to predict consumption behaviors (Wise, Bolls, Kim, Venkataraman, & Meyer, 2008; Teo & Noyes, 2011). One explanation is that game enjoyment may evoke a processing route shift. Thus, whether the same effects on gamers' attitude toward sport will repeat in sport games will be an interesting topic to examine. The current study identified whether the sport content has the persuasive effects on gamers. In other words, how

much gamers are influenced by the sport content that they are not pursuing as a major purpose is the focus of this study. To investigate this, the first research question of the current study is:

RQ1: To what extent does sport video gaming influence gamers' confidence in the sport?

The sport video game playing was examined in terms of the time spent on the game, the performance of the gamers during playing, and the immersive degree of the game. These three factors are explained in detail in the following literature review section. By this way, this study looks forward to improve our understanding on how much is the sport gamers' attitude of the real sport impacted by sport game playing, and furthermore to offer some operational suggestions for game designers and sports leagues to better promote their product among gamers.

Sport Gaming and Exercise

According to the ELM (Cacioppo, Claiborn, Petty, & Heesacker, 1991), the attitude change following central route of processing is predictive for behavior change. If a processing route shift does occur in sport gamers as the current study speculated above, a behavior change toward the sport should be expected. Former studies about the potential medical use of virtual environment and video games support this prediction by offering evidence of the possibility to change gamers' thought as well as their behaviors by video game playing. Yee, Bailenson, and Ducheneaut (2009) has shown that virtual environment is powerful enough to change people's perception of themselves as well as the world, and the effect may lead to behavior change in real world. Levac, Pierrynowski, Canestraro, Gurr, Leonard and Neeley (2010) have also stated that the virtual reality game play have a substantial effect on children's movement characteristics. Similarly, Papastergiou (2009) has stated that video games have great potential for health and physical education based on past literatures. However, there is still little research examining the

relationship between sport video game playing and real sport. Therefore, the second research question of the current study thus is addressed to explore this relationship:

RQ2: To what extent does sport video gaming influence gamers' desire to play the sport?

By answering the second research question, this study aimed to explore the potential of using sport video games for health promotion such as exercise campaign and physical education.

The following chapters dig into the study of sport game playing and gamers' perception and attitude. Chapter 2 explains how the ELM fits in sport video gaming as a systematic theoretical framework and dig past literatures to support each implying hypotheses from the ELM and to operationalize the key concepts. Chapter 3 goes into the methodology decisions and the rationale behind it.

Chapter 2: Literature Review

Past literature is reviewed in this chapter to explain how sport video gaming may be viewed as a persuasion and how the ELM fits in the persuasive process. Hypotheses are proposed based on the implication of the ELM. Relevant studies are reviewed to support the hypotheses and to provide operationalized definitions of the key concepts in research questions.

RQ1: To what extent does sport video gaming influence the gamers' confidence on the sport in real life?

RQ2: To what extent does sport video gaming influence the gamers' desire to play the sport in real life?

Persuasive Games

Bogost (2006, 2007) brought the concept of persuasive games to explain how do video games have persuasive power. Rather than presenting persuasive text directly to the information recipients' attention, video games generate a context in which the gamers place themselves automatically in certain positions and start to think and act as if they are in the position.

Extensive studies about brand and political attitude change and value change in role-playing virtual environment support Bogost (2006, 2007) (Wise et al., 2011; Alhabash, Wise, 2012; Yee, Bailenson, & Ducheneaut, 2009). Besides the recall of brands and advertisements that appear in the game, gamers also show an attitude change in favor of their assigned role in the virtual environment even though the change is totally opposite to their original attitude. Alhabash and Wise (2012) supported this argument when they found that people tend to have a positive attitude toward the nation they represent in the Palestinians- Israelis video game since they behaved as a real representative of that nation. Yee, Bailenson and Ducheneaut (2009) held a similar view that people in virtual environment tend to represent themselves and modify their values and beliefs according to their role in the virtual environment, even though the position contradicts their original beliefs completely. The transformed representation remains for a period of time even when people are no long in the virtual environment, the length of which depends on the level of immersion experience of the users, leading to temporarily attitude change. Thus, it's firm grounded to treat sport video gaming as a persuasive context since the gamers need to take the position of athletes and to think and act like athletes do in real sport. This provides rationale of applying the ELM of persuasion to sport video gaming.

Sport Game Playing and Elaboration Likelihood Model

The Elaboration Likelihood Model is a classic model of persuasion and attitude change first came up by Petty and Cacioppo (1986) that has been extensively applied to media effect. However, few studies incorporated this lens into video game research. According to ELM, there are two information-processing routes in attitude change, the central route and the peripheral route. When information is processed through the central route, which takes more elaboration on the validity and credibility of the information, the recipient is more likely to gain a sustained attitude and further behavioral change (Capioppo et al., 1991). Two major factors decide which route the recipient will take: the motivation and the capability of the recipient to process the information. Specifically, the factors were treated sport gamers' motivation to engage in the sport and ability to process sport information. See Figure 1 for the details of the extended model.

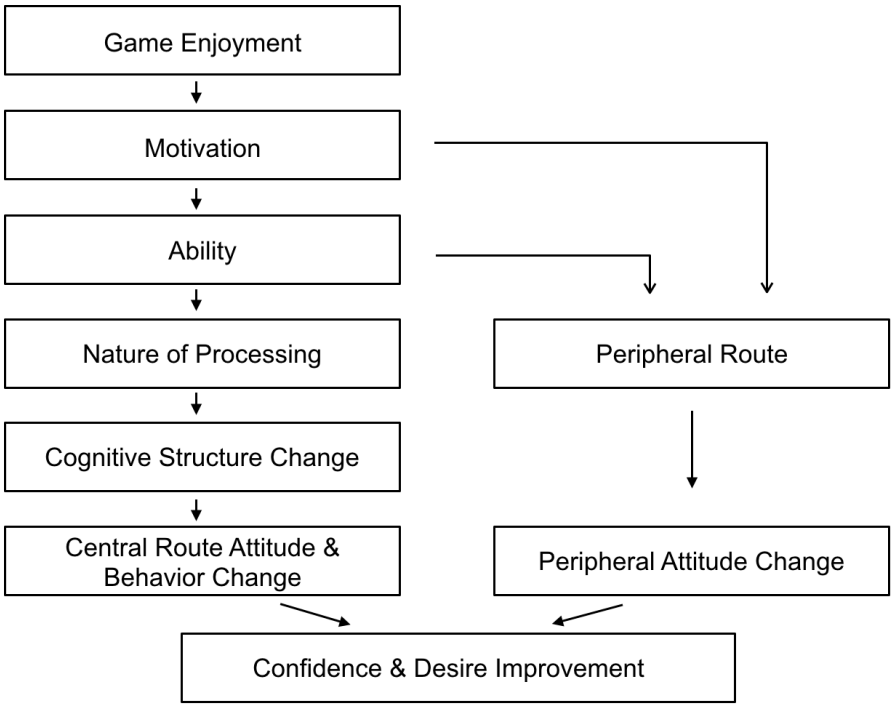

Figure 1. The ELM Extended to Sport Video Gaming Context

Sport Gamer Motivation

In a lens of ELM, video game playing can be considered as information processing where the recipients engage in all content embedded in the game playing. During the game playing, as stated above, team identification is one major motivation for sport gamers while the other two: entertainment and competition don't directly associate with the sport itself. Team identification relates to the teams and sport fandom rather than the sport itself like how to play exactly and accomplish sport goals. Thus, a peripheral route of processing the sport content is assumed.

Cacioppo, Claiborn, Petty, and Heesacker (1991) suggested that the two routes may take place at the same time and the route for processing certain part of information may be shifted by the recipients' mood, evaluation and motivation. In other words, when gamers obtain great satisfaction from the game, they are encouraged to take more elaboration on the tactical level as well as techniques of the sport in order to reinforce and improve this satisfaction. Sherry, Lucas, Greenberg, and Lanchlan (2006) also supported this in a uses and gratification lens stating that gratifications obtained will encourage further uses. This implies that satisfaction gained from the game may facilitate gamers' motivation on elaboration of the sport itself such as skills and tactics. Thus, the game enjoyment can be considered as a predictor of route shift and subsequently attitude and behavior change.

According to Sport Motivation Scale brought by Pelletier, Fortier, Vallerand, Tuson, Briere, & Blais (1995), there are two types of motivation to play a sport- intrinsic motivation and extrinsic motivation. Extrinsic motivation refers to the regulation from organizations and groups, the pressure from other people as well as other factors casted on people from external sources. Pelletier et al. (1995) stated that compared to extrinsic motivation, intrinsic motivation are much stronger and effective. Intrinsic motivation refers to the subjects' inner experience and desire to

play the sport when they find the playing is satisfying and interesting. Intrinsic motivation includes knowing more about the world, to accomplish goals for fulfillment, and to experience the stimulation from the sport (e.g. sensory pleasure, arousal, happiness, excitement, etc.).

In the case of video gaming, the game enjoyment creates satisfaction for gamers so they will find the game entertaining and exciting (Wise, Bolls, Kim, Venkataraman, & Meyer, 2008; Teo & Noyes, 2011). For sport video gaming, since the game process is based on real sport behaviors in a virtual environment. As an implication of the finding of Sherry et al. (2006) that video game enable gamers to achieve goals without limited by their physical ability, the enjoyment sport gamers acquire largely depends on accomplish real sport goals and the simulation of succeeding in sport activities, which can be considered as finding the sport satisfying and entertaining, and is likely to encourage motivation to play the sport. Based on above arguments, the attitude and behavior change of gamers are considered potential results of a possible processing route shifting evoked by increasing motivation during game playing.

Dimensions of Sport Video Gaming

Enjoyment has been studied as the key factor for attitude change during gaming (Wise, Bolls, Kim, Venkataraman, & Meyer, 2008; Teo & Noyes, 2011). According to them, enjoyment creates a satisfaction and reward of playing, which consist the two most important process of attitude change. So enjoyment is a major predictor of motivation change and further more the rout shift. Thus, game enjoyment and gamer motivation are the first stage to operationalize sport video gaming and break it into observable measures in this study.

Sweetser and Wyeth (2005) developed a model to evaluate the enjoyment in video games, consisting of eight elements: “concentration, challenge, skills, control, clear goals, feedback, immersion, and social interaction”(p. 2). Kim and Ross (2006) developed a motivation scale for

sport gamers based on the Uses and Gratification paradigm with seven major motives: identification with sport, entertainment, fantasy, knowledge application, social interaction, competition, and diversion. Cianfrone, Zhang, & Ko (2011) modified and extended the scale to eight factors: competition, diversion, enjoyment, fantasy, social interaction, sport interest, sport knowledge application, and team identification.

Gentile (2011) stated in his research about the media effect of video game violence on adolescents that the video game effects have multiple dimensions: 1) amount of game play; 2) content of game play; 3) game context; 4) game structure; 5) game mechanics. Pasch, Bianchi-Berthouze, Dijk and Nijholt (2009) did a great job to describe the relationship of play, game, sport, and exercise. According to them, game is any form of competitive play. And sport is an institutionalized game with certain organization, governing and equipment. Competition here plays a crucial role of elevating behavior of random and non-purposeful play into a game. When Gentile examined these items as the factors that may influence the video game effects, the current study incorporate these items together with research on game enjoyment to put up following three measures of sport gaming that is potentially influenctial to the persuasive effects.

Time

Time refers to the amount of game play (Gentile, 2011). As stated above, the time spends on the game influence directly the experience of gamers and their exposure to the persuasive information.

Performance

The performance of gamers is a combination of the competition and social interaction in the motivation scale of sport gamers (Kim & Ross, 2006; Cianfrone, Zhang, & Ko, 2011).

Besides, performance is also an important indicator of game enjoyment especially the accomplishment of challenge (Sweetser & Wyeth, 2005).

Immersive degree

Sweetser et al. (2005) mentioned immersion as a factor for enjoyment. Abbasi and Baroudi (2012) defined "immersive environment" as " immersive a human or an object in a digitally constructed environment" (p. 80). They pointed out that when immersive environment creates a very similar user experience as virtual reality (VR), it doesn't necessarily need a simulation of the reality. Instead, immersive refers to the user experience of being part of the simulated world.

Although immersive games have been extensively studied in terms of its potential to change people's attitude and behavior in real life, the current study will examine immersive degree only as a predictor of game enjoyment since the physiological change during virtual environment falls into a completely different process. However, studies with physiological psychology lens on virtual environment can offer a better description of immersive games in order to measure the immersive degree. Shafer, Carbonara, and Popova (2011) found that motion-based gaming system improves gamers' perceived reality and enjoyment in two experiments. Perceived reality is a significant predictor for spatial presence and further game enjoyment, providing a more immersive experience for gamers. Trepte and Reinecke (2010) also pointed out that the fidelity of the avatar relates to gamers' enjoyment closely since a more realistic avatar provides a better immersive experience. This is consistent with the perceived reality argument by Shafer et al. (2011). Pasch et al. (2009) also found that motion-based sport games can increase gamers' enjoyment since it improves the user experience in two dimensions:

game and simulation. During motion-based game playing, the fulfillment of gamers is beyond mental since their body movements may have direct influence on the game results.

To synthesize, sport video game playing is examined in terms of time, performance and immersive degree of the game in order to investigate the attitude and behavior change in this study.

Gamers' Confidence on the Sport

Sport confidence refers to "the belief of degree of certainty that individuals have about their ability to be successful in sport" (Vealey, 1986, p.222). Thomas, Lane, & Kingston (2011) further developed the concept and came up with specific items of sport confidence by a study of qualitative interview. Three major themes they found that are relevant to the current study are physical ability and skills, tactical knowledge and recovery speed while the rest goes into the sport medicine, sport game management and athlete self-development in detail. For the current study, since the gamers are not playing the real sport and suffering no injury, the confidence of recovery should be excluded. Thus, the two major aspects of sport gamers' confidence are: confidence of their capability and their knowledge of the sport. Note that the current study examines psychological effects of games on confidence. The knowledge of the sport refers to level of confidence of their knowledge instead of measuring how much knowledge they actually acquire.

According to Sherry, Lucas, Greenberg, & Lanchlan (2006), video games offer gamers the chance to achieve goals without the limits of their physical ability and real skills. Unlike gamers for battle games and first person shooting games, what sport gamers can achieve in sport games are based on the simulation of the real sport. Battle gamers and first person shooting gamers don't have the chance to encounter a real battle or shooting in their life, while sport

gamers are largely experience the game content that are very similar to their daily experience, either playing real sport or watching it. Kim, Walsh and Ross (2008) investigated 293 sport gamers of their psychological and consumptive behavior and pointed out that fulfillment of achieving sport goals that are difficult to access in real life is an important gratification that sport gamers gain from the playing. This implies that the sport game playing may offer gamers the experience of achievement of goals they are not capable and may lead to a belief of an improvement of ability to play the sport.

In the ELM lens for gamers' confidence change, sport game playing may influence their confidence by offering satisfaction and motivation that motivates more elaboration of gamers on the sport. Based on this argument the current study proposes a causal relationship between sport game playing and gamer confidence. Furthermore, the process of athlete confidence change is employed to come up with specific hypotheses together with the ELM lens.

Gilson (2010) suggested in the research of confidence change and outcomes in sport training settings of athletes that sport confidence comes from four major sources: mastery experience which refers to athletes' memory of past experience of the similar task and their performance in the past, vicarious experiences which refers to observation of the successful situation, verbal persuasion which refers to a social interaction in which athletes are assured by others' acknowledgement, and physiological perceptions of their physical ability.

Accordingly, the increase of time spend on the game, not only directly improves gamers' enjoyment, but also assure them a longer exposure to the sport content, which provides them more observation of successful situations of the sport and a stronger feeling of accomplishment of sport goals by the playing (Gilson, 2010). Kim et al. (2008) found that gamers who spend more time on the game, also identified as the heavy gamer, are more likely to apply their own

knowledge of the sport into the game in order to perform well. So this playing process involves both gaming techniques and gamers' knowledge about the sport figures and tactics. Therefore the first two hypotheses are addressed:

H1: Subjects who play the sport video game for more time will have higher confidence in the sport.

Similarly, the better performance in the game affirms gamers' mastery experience (Gilson, 2010) by successfully play the sport in virtual environment. The prior position in competition with others implies a high evaluation from social interaction (Gilson, 2010) and therefore reinforces gamers' confidence. Together with the enjoyment improvement brought by better performance, this argument addresses the following two hypotheses:

H2: Subjects who perform better in the game will have higher confidence in the sport.

More immersive games create an experience of more realistic sport environment (Shafer et al., 2011), and therefore strengthen all the four sources of confidence enhancement (Gilson, 2010) by simulating those experience in a more realistic way. The higher immersive degree also ensures a higher enjoyment (Shafer et al., 2011), which is more likely to encourage more elaboration on the game as well as the sport and eventually lead to attitude change toward the sport. Therefore, the current study proposes the following hypotheses:

H3: Subjects who play more immersive game will have higher confidence in the sport.

Gamers' Desire to Play the Sport

Rather than examining the actual post-game sport behavior in real life, the current study focuses on gamers' desire to play the sport in real life, given the fact that the execution of sport behavior is influenced by complex feasibility factors aside from the intention to do so.

According to the ELM, the improvement of satisfaction leads to motivation for gamers to process the sport content in the game via central route, which predicts a higher chance of stronger and more sustainable attitude change and eventually a behavioral change. The first hypothesis that sport gamers will be more motivated to play the sport after playing the game also implies an increase of desire to play to sport.

Besides, Kim et al. (2008) also found that heavy gamers are usually more identified as sport fan and more likely to have consumptive behaviors, which justified the ELM argument. Yee et al. (2009) had the similar finding that virtual environment is powerful to change people's perception and then lead to behavior change in real world. The strength and duration of the behavior change are largely and positively related to the level of immersion people experience in the virtual environment. Physiological psychologists argued that video game have great impact on changing people's behaviors by influence their physical status and subsequently their psychological cognitions during the virtual environment experience. When people perceive their own physical change such as heart rate and temperature increase, they imply a psychology process to explain the physical change, which may further influence their original attitude and behavior (Blanc, Freyssin, Riviere, Mourot, Benaich, Boussuges, & Maunier, 2011; Yamaguchi, Maki, & Takahashi, 2011). Kato (2010) also backed the argument up by stating that commercial video games may have positive effect on gamers' attitude and knowledge of health improvement. This supports the prediction of ELM in sport game playing in a physiology perspective. Thus, a

positive causal relationship between sport gaming and desire to play the sport is established. Following hypotheses are proposed to test the prediction:

H4: Subjects who play the sport video game for more time will have higher desire to play the sport

H5: Subjects who perform better in the game will have higher desire to play the sport

H6: Subjects who play more immersive game will have higher desire to play the sport

Chapter 3: Method

In this chapter the experimental design and the rationale behind it are discussed. The current study employed a Pretest-Posttest experimental design to investigate the game effects.

Participants

The population for sampling was college students. According to Entertainment Software Association, people aged 18-35 comprise 36% of video gamers (Entertainment Software Association, n.d.). Meanwhile, 49% of sport gamers are from 18-24 years old and 32% are from 25-31 (Stein, Mitgutsch, & Consalvo, 2012). College students, although they do not fall into this range necessarily, are representative of the major population of sport gamers. Although this population lacks diversity in terms of occupation and social status, an explanatory pattern of causal relationship between stimuli and effect is comparatively generalizable and stable (Babbie, 2013).

Since human subjects were involved in the study, IRB was required. The current study qualified for exempted IRB approval since there was no sensitive population involved. Besides, The research questions and experiment procedure had neither any harm to the subjects nor discussion of any sensitive topics.

A purposive method was used to develop the sample. The major recruiting site was a mid-sized college campus. Posters and flyers were used to attract attention of the population. Subjects were qualified only if they have limited (no experience or just very few, according to their self-report) experience in playing golf or golf video games and watching golf matches before. Qualified volunteers were also asked to bring a friend with same level of experience. Fifty-six participants were recruited in total. This purposive sampling diminished the intervening effects of subjects' past golf experience on their confidence and desire since only participants with limited golf experience were recruited. The randomization of assigning subjects further enhances the representativeness of the sample (Babbie, 2013). The pairs were numbered randomly from 1 to 28 using a random number generator and assigned to different groups according to the number.

Materials

An experimental design was chosen to test the hypotheses since the current study aimed to examine a causal relationship between sport game playing and gamers' attitude and behavior change. As Babbie (2013) stated, "experiments focus on determining causation (p. 231)", it is a very appropriate method to establish a causal relationship of the stimuli put on the subjects and the effects.

The hypotheses of the current study were tested in a 2 (time) x 2 (immersive degree) between subjects experimental design. The manipulated factors were the time of game playing (long/short) and immersive degree (high/low), while the other independent variable-performance was examined by measuring the actual playing process of each subject.

Tiger Woods PGA Tour 14 (PGA Tour) on Xbox was the experiment instrument. Tiger Wood PGA Tour 14 is a golf game created by Electronic Arts Games (EA Games). It is

compatible with both traditional Xbox remote controller and motion-based input system –the Kinect sensor. This compatibility with different input system made PGA Tour very suitable for the current study to manipulate stimuli with the least intervening changes such as user interface and acoustic experience.

Time.

The first independent variable is how long subjects play the game. Time of game playing was manipulated at two levels – long and short based on the average time needed for completing the tasks in PGA Tour. Subjects who were assigned to a long time playing group played 9 missions in the game while those who were assigned to a short time played 5 missions. To ensure variance in playing time with the minimum difference brought by gaming content, all missions came from the same gaming scene with the participants assigned to the short time group only played first half of the scene. Specific time of each pair of gamers spend was marked. In this manner the current study acquired a ratio level measurement of time.

Performance.

The performance of gamers wasn't manipulated in the experiment. Instead, each subject's score and rank of each game was measured as their performance. Specifically, the hits they used to accomplish all the missions were recorded. The deficits between the hits and the pars (standard hits assigned by the missions) were calculated as the grade of the participant as the independent variable performance. Thus, the level of measurement of performance was ratio.

Immersive degree.

Immersive degree was manipulated at two levels by assigning subjects to different gaming control methods of the game -the traditional controller (low) and the Kinect (high). Subjects who were assigned to a paddle group will play the game with a remote controller consists of joysticks and buttons. Joysticks were used to control the angle and direction of hitting and buttons were used to control specific hitting movement. Subjects who were assigned to a Kinect group played the game by moving their body in front of the sensor. They can control the angle and strength of hitting by using their arms to input orders in the game and implement their decisions by spinning their bodies and waving their arms. Immersive degree is a nominal level variable in the current study.

Confidence

Subjects' confidence in golf was measured using a confidence scale based on the categories of sport confidence established by Thomas, Lane, and Kingston (2011) and Hays, Maynard, Thomas, and Bawden (2007). Five items including confidence in winning, techniques, physical skills, psychological adjustments, decision making for changing conditions were measured by asking subjects to assess their agreement to respective statements from not at all (1) to very much (7). These five items together measured subjects' confidence on their capability. The researcher rephrased them these five items in the questionnaires with a Cronbach's Alpha of 0.85 for the pre-game questionnaire and 0.79 for the post-game, which suggested good reliability. Similarly, four items including confidence in "understanding terminology, tactical awareness, recognition of others' behavior, and fair judgment of the situation" measured subjects' confidence on their knowledge of golf in a same scale. Therefore, confidence was measured as a

ratio level variable. Cronbach's Alpha also suggested satisfactory reliability through these items with 0.85 for the pre-game and 0.84 for the post-game.

Desire

Desire refers to subjects' wish to play golf in real life, regardless of the daily situation and practical execution. Similar to confidence, desire was measured by subjects' agreement to a set of statements regarding their desire to play golf on a scale from 1 to 7. Three items including the desire of playing golf, the probability to encourage friends to play golf, and the desire to do things related to golf again based on the measurements for behavioral intention of sport events consumers established by Yoshida, James, and Cronin Jr (2013) were examined as ratio level variables. The reliability tests turned out favorable as well with the Cronbach's Alpha of 0.88 for both pre-game and post-game.

Intervening Variables

Several variables were set to explore potential influence on particpants' confidence and desire. These variables were measured by items in the pre-game questionnaires. Given to the possible effects of daily exercise habit may influence participants' desire to carry out a new sport, exercise routine was set by a self-evaluation item. Besides, participants' preference on golf as well as video gaming was investigated by two items in the pre-game questionnaires. By doing this, the researcher aimed to exclude possible intervening effects of existing preferecnes on the experiment results.

Design and Procedure

Subjects were randomly assigned to one of the four cells in pairs. These four cells were: long time playing with high immersive degree game; short time playing with high immersive

degree game; long time playing with low immersive degree game; and short time with low immersive degree game (See Table 1 in Appendix).

Pretest questionnaire. Subjects were asked to respond to a paper questionnaire ahead of the test. The questionnaire contained filter questions including past experience with golf to reaffirm the validity of samples, personal preference of golf to learn about potential intervening variables, and dependent measures of their confidence in golf and desire to play it.

Game playing. Subjects were voluntarily paired up and then assigned to the four groups. Each pair played on the same instrument. Each pair of the subjects played the game simultaneously after a 15-minute training of how to use the game controller or the Kinect sensor. Subjects accomplished tasks in the same scenes during the experiment. In the game subjects used either the paddle or their body movement to hit the ball into the hole through different terrains and hazards. Subjects needed to take angles, strength, directions, obstacles, and the wind into consideration during the hitting. The score of their playing was decided by the number of the hits to complete the goal.

Post-test questionnaire. Subjects were asked to respond to a post-test questionnaire right after game playing. The questionnaire contained enjoyment of their gaming experience, self-assessment of performance and the same dependent measures as the pretest questionnaire.

Thread to Validity

The threat to internal validity exists in the sampling method. The study used purposive sampling instead of probability sampling. This might bring in selection biases in the sample that the subjects who are willing to participate are those who have comparatively more interests in golf or golf games. The potential antecedent preference may influence their attitude and behavioral change. However, as Babbie (2013) stated, “probability sampling of less than 100”

are not representative enough, and it's usually impractical to have more than this number in social experiments. Randomization can therefore be used to make it up to some degree (p. 236).

The purposive sampling seems also brought in threat to external validity since Stein, Mitgutsch, and Consalvo (2012) found that over 90% of sport gamers are sport fans and have television sport viewing habits. That means most of the sport gamers are not likely to have no experience and knowledge of the sport before video gaming. However, what the current study looks for is a prediction of tendency between sport gaming and gamers' attitude and behavior about the sport. The prediction served to explain one factor that may influence gamers' attitude and behavior rather than to identify all possible factors.

Chapter 4: Result

Manipulation Check

As this is a training application we verified that users siginificantly attended to the tasks and showed improvement in game play and attitude**.** A series of T-test were used to compare the means of pre-game and post-game measures. Results suggested that gamers' confidence on their ability (N=56, df=110, t= -3.88, p< .001), knowledge (N=56, df=110, t= -7.90, p< .001), and desire to play golf (N=56, df=110, t= -4.88, p< .001) all increased significantly after game playing.

Hypotheses Testing

The first three hypotheses tested the effects of the time of playing, performance during the game, and immersive degree on predicting gamers' confidence in golf. Multiple linear regression analysis was used to test the first three hypotheses, to test the effects of three independent variables controlling the pre-game confidence.

A multiple linear regression was calculated to predict post-game confidence based on the time spent on play, performance and immersive degree. For the immersive degree, dummy variable was coded as the high immersive degree method coded 1 and low immersive coded 0. A significant regression equation was found ($F(4, 51) = 5.39$, $p < .001$), with an R^2 of .30. Users' predicted post-game confidence is equal to 24.10 + 0.28 (Pre-game Confidence) + 0.05 (Time) + 0.40 (Performance) – 0.05 (Immersive Degree), where gaming method is coded as 1 = Kinect, 2 = Controller, and time was measured in minutes. Gamers' post-game confidence increased 0.05 unit for each minute they spent, and 0.40 unit for each unit of performance. Users with Kinect had 0.05 unit less of the post-game confidence than users with controller. Both time ($\beta = .15, p < .05$) and performance ($\beta = .33, p < .05$) were significant predictors of post-game confidence(See Figure 2). The pre-game confidence, not surprisingly, also significantly predicted the post-game confidence($\beta = .44$, $p < .001$). Therefore, H1 and H2 were accepted. H3, however, was rejected since gaming method was not a significant predictor for the post-game confidence.

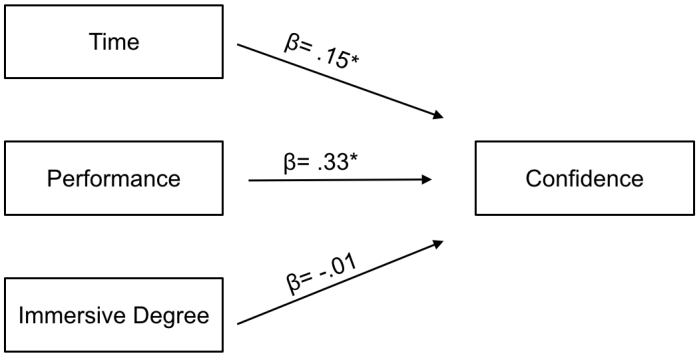

Figure 2. Regression Analysis Result of Confidence

Table 1

Summary of Multiple Linear Regression for variables Predicting Post-game Confidence (N= 56)

Variables	Post-Game Confidence		
	B	SE B	β
Pre-game Confidence	.28	.07	.44***
Time	.05	.04	.15*
Performance	.39	.15	.33*
Gaming Method	-.05	1.38	-.01
$\boldsymbol{R^2}$		.30	
F		5.39***	

*$p< .05$, ***$p< .001$*

Similarly, a multiple linear regression was calculated to predict post-game desire based on the time spent on play, performance and gaming method. A significant regression equation was found ($F(4, 51) = 19.16$, $p< .001$), with an R^2 of .60. Users' predicted post-game desire is equal to 1.31 + 0.51 (Pre-game Confidence) + 0.07 (Time) + 0.18 (Performance) + 0.52 (Gaming Method). Gamers' post-game desire increased 0.07 unit for each minute they spent, and 0.39 unit for each unit of performance. Users with Kinect had 0.52 unit more of the post-game confidence than users with controller. All three variables, time ($\beta = .41, p< .001$), performance ($\beta = .25, p< .05$), and gaming method ($\beta = .08, p< .05$) were significant predictors of post-game confidence (See Figure 3). The pre-game desire also significantly predicted the post-game desire ($\beta =. .68, p< .001$). Therefore, H4, H5, and H6 were all accepted.

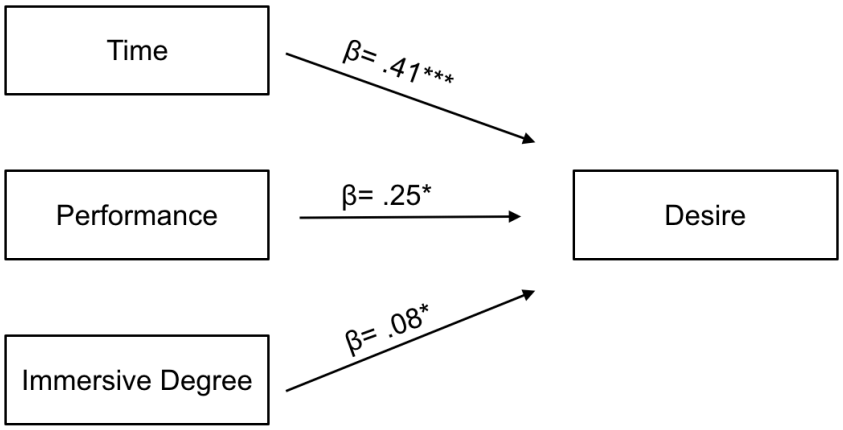

Figure 3. Regression Analysis Resulf of Desire

Table 2

Summary of Multiple Linear Regression for variables Predicting Post-game Desire (N= 56)

	Post-Game Desire		
Variables	B	SE B	β
Pre-game Desire	.51	.07	.68***
Time	.07	.02	.41***
Performance	.18	.07	.25*
Gaming Method	.52	.62	.08*
$\boldsymbol{R^2}$		.60	
F		19.16***	

*$p< .05$, ***$p< .001$*

In addition to hypotheses testing, the researcher also made a correlation matrix to test each dependent variable with all possible influential factors including golf experience, daily exercise and preference for video games, and the enjoyment during the game, in order to gain a comprehensive estimate of the variance of the dependent variables. As the table shows,

enjoyment was found significantly correlated to the two dependent variables (r= .46, p< .01; r= .40, p< .01) as well as daily exercise routine(r= -.30, p< .01) and preference for video games (r= .45, p< .01). Besides, confidence was found correlated with desire (r= .55, p< .01), game scores (r= .29, p< .05), exercise routine (r= .27, p< .05) and preference for video games (r= .32, p< .05).

Table 3

Correlation of Dependent Variables with Pre-Game Variables

	1	2	3	4	5	6	7
1.ConPo	--	**.55****	**.29***	**.46****	.05	**.27***	**.32***
2.DesirePo		--	.20	**.40****	.04	0.2	.22
3.Performance			--	.25	-.24	.14	.20
4.Enjoyment				--	-.14	**-.30****	**.45****
5.Golf Experience					--	.18	-.09
6.Exercise						--	-.03
7.Game Preference							--

*** Correlation is significant at the 0.01 level (2-tailed).*

** Correlation is significant at the 0.05 level (2-tailed).*

The researcher also further tested the interaction of enjoyment with those independent variables that found significantly influential to dependent variables. Among all the tests, the researcher found that the enjoyment and time of gaming had statistically significant interaction effects on the improvement of desire to play golf (df=15, F=6.08, p< .05). Besides, the interaction effects of enjoyment and the performance were found significant to the improvement of desire to play golf as well (df= 13, F=2.96, p< .05).

Chapter 5 Discussion

In this chapter the researcher interpreted the experiment results and discussed all the findings. The persuasive power of gaming was supported by the fact that all dependent variables showed significant improvement after game playing. This provided evidence for the persistence of persuasive effects of role-play gaming found by Bogost (2006, 2007), Wise et al.,(2011), Alhabash et al, (2012) in sports video gaming. What's more, it also justified what Yee et al, (2009) brought that the virtual environment may affect people's attitude and behavior and the effect may extend to the real world.

The Elaboration Likelihood Model and Sports Video Gaming

The ELM served as an important part of the theoretical frame of the relationships between sports video gaming and gamers' attitude change. Instead of examining the exact information-processing route, this study aimed to measure the enjoyment as a predictor of route change and the subsequent improvement of attitude change. As the result shows, enjoyment significantly correlated with both dependent variables and had significant interaction effects with game playing on the improvement of all dependent variables. The higher the enjoyment was, the more likely the participant would present higher confidence and desire. It might be too assertive to conclude that such improvement was due to a processing route shift during game playing based on simply the correlation of enjoyment and dependent variable changes. However, this study provided an implication that the increasing tendency of game enjoyment, which could potentially evoke route shifting, had positive effects on the attitude and behavior change. To illustrate a more precise description of route shifting in sports video gaming, future research should focus on the information processing including motivation measures and cognitive structure changes.

Time spent on playing

Gentile (2011) described a pattern where the effects of video game violence are largely augmented as the amount of play increases. This study proved a similar pattern in video gaming when the exposure to sport content increases. As the result showed, the time participants spent on gaming is crucial for improving both their confidence and desire.

Time spent in gaming was found positively related to the participants' confidence in golf. As discussed above, participants who were exposed to the game for longer time were more likely to acquire higher enjoyment and satisfaction, which subsequently led to stronger attitude change. More importantly, longer exposure ensured better chance for more observation of successful sport situation and experience of goal accomplishment. Larger amount of play provided longer exposure to the sport content imbedded in the game and therefore enhanced participants' learning opportunity of the knowledge about golf, according to Gilson (2010), which is a substantial source of sport confidence. Besides, the increase of self-estimation of completing the game also supplied more cases of successfully applying their learning during the game.

Same pattern could also be employed to explain that the desire to play golf also showed a higher increase among those participants who played the game for more time. What's more, participants may also have the desire to replicate the achievement after gaming if they repeated the successful situation for more times.

Performance during gaming

The performance satisfies gaming experience by increasing the mastery and accomplishment of challenge according to Kim et al (2006) and Cianfrone et al (2011). Besides, since the participants were tested in pairs and the grades of their performance were measured by

the deficit of their actual hits to the standard parameters of game setting (i.e. the grades), performance also provided source of competition. In this study, both the grades and the game results within the pairs were recorded. While the game result stood for the competition in terms of social interaction of gaming, the grades offered comparison of participants' self-perception of their performance to the standards in real sport of golf. Higher grades ensured not only winning within the pair, but also gave them sense of their accomplishment compared to the most successful golf players in the real world. Therefore, grades were chosen as the main indicator of participants' performance.

The results denoted statistically significant relationship between the performance and participants' confidence and desire. Better performance positively predicted gamers' confidence in golf and desire to play it afterwards. This is a great evidence of the effects of performance during sport video gaming on the attitude and behavior change. In terms of the ELM, this also supported that better performance led to better persuasion, given that the competition and satisfaction that performance brought offered motivation for participants to deliberate more on the sports content and gaming control.

However, while grades were found significantly related to all improvement, the game results had only effects on the confidence. Unexpected may it seems to be, it's not that surprising if the difference of the competition nature in grades and results were taken into account. Participants were voluntarily paired up while recruiting in order to ensure better gaming experience since people tend to have better game enjoyment and more comfortable behaviors if gamers have personal connections according to the research about online gaming communities by Hsiao, C. C. and Chiou, J. S. (2012) and the research of sport enjoyment by Wankel, L. M. and Kreisel, P. S. (1985). This, however, may influence the intensity of social competition

against each other. Chances are that participants didn't perceive the existence of each other as opponent but as companions who shared enjoyment. This could also support the fact that the grades, which inferred the comparison with sport standard and professional players, were found more significantly related to the improvement of confidence and desire.

Immersive degree on attitude and behavior change

Immersive degree was manipulated by two control modes of completing the game in this study. According to the results, participants in body-movement gaming group had higher desire to play golf. Pasch et al. (2009) stated that body movement might increase gamers' enjoyment and satisfaction by extending the achievement from simply mental success of using strategy and overcoming virtual obstacle to concrete and physical experience. Compared to the traditional controller mode, body movement in this study provided participants physical accomplishment of golf goals. This also coordinates the motion-based games' power on gamers' attitude and behavior change brought by Pasch et al (2009) and Shafer et al. (2011). Meanwhile, body movement gaming equipped participants physical success of completing the sport by achieving game goals with simulation of real golf moves. According to Yee et al. (2009), the strength of immersion in the virtual environment is positively related to the strength and duration of attitude and behavior change. The difference between body movement gaming and controller gaming verified the point of Yee et al (2009) that reinforce their experience of the sport satisfaction led to stronger desire to repeat the success in real life. This also concurred with Blanc et al (2011) and Yamaguchi et al. (2011) that immersion may arouse higher enjoyment and attitude and behavior change in physiological lens. The ELM could also be employed to justify the finding that the higher satisfaction brought by immersion motivated participants to further dive into the gaming in order to replicate the success and fulfillment.

According to ELM, behavior change requires more elaboration than attitude change and often is considered as the next stage of persuasion. Successfully completing the physical simulation of the real golf playing is also providing more sport confidence as discussed above. Surprisingly, the researcher failed to find significant difference between the two groups' confidence in golf. Immersive degree didn't predict higher confidence in golf. This seems contradicting the other findings. However, the change of immersive degree may cause more changes other than improving enjoyment and simulation satisfaction that may balance the positive effects in this study. Pasch et al (2009) and Shafer et al. (2011) has discussed how motion-based game may augment gamers' gaming experience and most importantly, immersion. As for sport video gaming, the immersion simulates the real accomplishment of motional goals. Compared to traditional controller, gamers' might have higher conscious of the sport as physical motions. Improvement of enjoyment brought by immersion has been already discussed, yet the awareness of the difficulties of the real sport hasn't been noticed. It might be possible that the gamers' experienced a higher simulation environment and perceived the sport as physical movement other than just a video game. That might be the balancing factor for the sport confidence in terms of all the testing items, like physical ability. To further explore this speculation, future studies are encouraged to set measures to test the awareness of the physical nature of the sport under different gaming method.

Another possible reason might be that the difference of the learning process of the two control modes was not sufficient to produce knowledge difference, which is considered a very important source of sport confidence according to Thomas et al (2011). Although body movement in this study offered more physical fulfillment than controller gaming, it didn't require the participants to improve actual golf playing skills due to the limitation of the

experimental instrument. Instead of accurate moves and techniques, the golf game only required participants to simulate a simple wave of arm and rotation of body. In other words, the biggest difference of the two control modes is how participants could implement their decisions made in the games. The key factors for gaming, like the angles of hit, consideration of wind and terrain, rotation of the ball, etc., were the same among participants in the two groups. Future studies are encouraged to extensively investigate this with improved instrument offering larger difference on the gaming modes.

Tables

Table 1

Summary of Multiple Linear Regression for variables Predicting Post-game Confidence (N= 56)

	Post-Game Confidence		
Variables	B	SE B	β
Pre-game Confidence	.28	.07	.44***
Time	.05	.04	.15*
Performance	.39	.15	.33*
Immersive Degree	-.05	1.38	-.01
$\boldsymbol{R^2}$		.30	
F		5.39***	

**p< .05, ***p< .001*

Table 2

Summary of Multiple Linear Regression for variables Predicting Post-game Desire (N= 56)

	Post-Game Desire		
Variables	B	SE B	β
Pre-game Desire	.51	.07	.68***
Time	.07	.02	.41***
Performance	.18	.07	.25*
Immersive Degree	.52	.62	.08*
$\boldsymbol{R^2}$		.60	
F		19.16***	

**p< .05, ***p< .001*

Table 3

Correlation of Dependent Variables with Pre-Game Variables

	1	2	3	4	5	6	7
1.ConPo	--	**.55****	**.29***	**.46****	.05	**.27***	**.32***
2.DesirePo		--	.20	**.40****	.04	0.2	.22
3.Performance			--	.25	-.24	.14	.20
4.Enjoyment				--	-.14	**-.30****	**.45****
5.Golf Experience					--	.18	-.09
6.Exercise						--	-.03
7.Game Preference							--

*** Correlation is significant at the 0.01 level (2-tailed).*

** Correlation is significant at the 0.05 level (2-tailed).*

Table 4

Descriptive Statistics of All Measures

	N	**Min**	**Max**	**Mean**	**SD**
Immersive Degree	56	1	2	1.50	.51
Time	56	48	130	77.29	18.50
Performance	56	0	20	13.52	4.75
Post-game Desire	56	8	21	16.66	3.31
Pre-game Desire	56	3	21	13.80	4.40
Post-game Confidence	56	31	53	41.41	5.70
Pre-game Confidence	56	11	54	30.91	9.03
Enjoyment	56	4	7	6.18	.83
Preference for Video Games	56	2	7	4.80	1.49
Exercise Routine	56	1	7	4.32	1.69
Preference for Golf	56	1	7	3.27	1.45

Appendix

Measuring Instrument

Pre-Game Questionnaire Items

1. I like playing video games.
2. I do exercise as a routine.
3. I had some experience with golf in the past.
4. I like golf.
5. I think I can play golf well.
6. I can easily learn the techniques of playing golf.
7. I can understand the terminologies of golf.
8. I will be aware of the tactics during playing golf or watching golf games.
9. I know what people are doing when they are playing golf.
10. My physical skills are capable for playing golf.
11. I can make certain psychological adjustment during playing golf.
12. I can make right decisions during playing golf.
13. I want to play golf sometimes in the future.
14. I will encourage my friends to play golf.
15. I will try things related to golf in the future.

Post-Game Questionnaire items

1. I like playing video games
2. I can handle the control mode of the game.
3. I did well in the game.
4. I enjoyed playing the game.

5. I think I can play golf well.
6. I can easily learn the techniques of playing golf.
7. I can understand the terminologies of golf.
8. I'm aware of the tactics during playing golf.
9. I know what people are doing when they are playing golf.
10. My physical skills are capable for playing golf.
11. I can make certain psychological adjustment during playing golf.
12. I can make right decisions during playing golf.
13. I want to play golf sometimes in the future.
14. I will encourage my friends to play golf.
15. I will try things related to golf in the future.

Experimental Instrument

Video Game Interface: Tiger Woods PGA Tour 14

PGA Tour 14 on Xbox with Kinect

Experiment Instrument:

Xbox 360 with paddle and the Kinect sensor

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Social Media Use and Sports Fan Loyalty **May. 2014**

- Conducted 12 qualitative in-depth interviews and analyzed data with software Nvivo & Dedoose
- Came up with 4 key themes to describe the effects of social media use on sports fan loyalty

Facial Attractiveness and Gender of Tennis Players: A Content Analysis of Facebook Comments **Dec. 2013**

- Analyzed over 1200 Facebook comments with quantitative content analysis research method
- Built connection between the attractiveness and the media attention of tennis players

PUBLICATION

- ✧ Shao.L., Gong.X., (2014), The Influence of Governmental Microblogs on Newspaper Agenda: An Agenda-Setting Perspective Report, *Annual Report on Development of New Media in China*.
- ✧ Gong.X., (2011), Ambient Media: In the Views of Hall in The Silent Language, *Youth Journalist* (Chinese national core journal), 10(1),63

Professional Experience

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- Worked in one of the most advanced MIND Lab of HCI, Virtual Reality &Serious Game in the world, gained mastery of virtual reality &simulation research, physiopsychological measurement and instruments
- Helped on literature review, data collection and data analysis for over 20 projects and led to 13 conference acceptances. Topics includes environmental &PR campaigns, crisis communication, social media and leadership, and organizational communication
- Operated new media convergence and dissemination on 5 different social media

Teaching Assistant, Syracuse University **Aug. 2014-Dec. 2014**

- Assisted teaching and 5 student projects for quantitative research method class and led to 2 conference paper
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- Initiated an online picture marketing campaign for Spring 2013 with online survey (design and implementation), target audience focus group, and data analysis
- Assisted marketing analysis and report of third quarter of 2012

Wireless Dept., Mobile Portals Center of SOHU, Sohu.com Inc. **Aug.2012-Oct.2012**

- Participated in user interface design for a user-customized online reader and mobile application using Axure
- Selected and processed online content source for the subscribed reader, users increased for about 20%

OTHER SKILLS

- ✧ SPSS, Google Analytics, Axure, Nvivo, Dedoose, Morae, Adobe Premiere