Abstract

The purpose of this investigation is to understand highly immersive environments, such as virtual reality (VR), role in character identification of its users. This led to understand how a user of highly immersive environments take on a character role and release the character. The current study was conducted to understand this phenomenon. This study analyzed participants using a VR simulation and collected data via interview. Although this study was interrupted due to the COVID-19 pandemic, the data collected revealed users of VR experienced a sense of presence and immersion when participating in the character role.

Every day in our society we experience a breakthrough in technologies. That being a new advancement of medical technology, within the military, education, the world of commerce, etc.; advancing technologies to help ease the lives of citizens has been the goal of humanity for centuries (Hennenberg, 2017). With the invention of the wheel, the telegraph, television, and the latest creation of virtual reality (VR), society is advancing into the realm of virtual worlds in almost every aspect. The innovation of VR brings society into a new modernity, bringing with a new level of consciousness and innovation into the world. VR shows exponential possibilities in changing the world.

VR has been used in many educational disciplines and practices in the military and the world of commerce (Hennenberg, 2017). With these applications of VR and its utility within society, understanding how an individual adapts to a virtual environment (VE) becomes vital to understanding the application of VR as technology advances (van Dam & Stephens, 2018). Recent studies have shown that participants within the VE adapt to their VE first by acknowledging what their characters look like in VR (Arriaga et al., 2008; Barberia et al., 2018; Cohen, 2001; Dahlquist et al., 2010; Klimmt et al., 2010; Kushner, 2017; Stafford, 2005; Wagner et al., 2006; Wang et al., 2017). The participants acknowledge themselves before they proceed throughout the VE's they are exploring. Acknowledging one's position within VR is called character adaptation or "character on-boarding," however, for this study, I will be call this process en-roling.

The effectiveness of VR, as shown in recent studies, is the participants' ability to become fully immersed within the virtual environment (Arriaga, et. al., 2008; Dahlquist, et. al., 2010; Gualeni et al., 2018). Either believing that the VE the participants inhabit is believable, or if the participants can identify with the characters within the virtual environment. The phenomena of

en-roling and character relinquishing (which is the counterpart of en-roling and will be called de-roling in this study), within VR allows for a better understanding as to the utilities of VR and the impact VR can have on society when fully understood (Gualeni, et. al., 2018; Stafford, 2005). Studies have shown that when participants feel more present within a VR simulation, there is a positive correlation to the level of immersion they also feel and while presence and immersion are very important in achieving a "realness" in VR, the question of how to do participants en-role and de-role from VR still stands.

This research study aims to collect data to understand,

RQ1: How do participants of virtual reality adapt to a character role (en-roling) while in virtual reality?

RQ2: How do the same participants relinquish the character role (de-roling) when exiting virtual reality?

First, clear definitions of presence and immersion will be referenced in this study with their pertinence to VR. Presence is defined as having a sense of "being there" in the VE (Dahlquist et al., 2010, p. 589), and immersion is defined as a relation to "real-world sensory modalities," (Slater, 2003, p.1).

This paper will review the literature covered to explain the phenomenon of en-roling and de-roling with virtual environments (VE) and VR. The literature will also cover the theory of identification and liminality as they are used to help explain the processes of en-roling and de-roling within this study to understand this phenomenon. The methodology will then explain how the participants for this study were gathered, the setting of the study, the process of data collection and how the data will be analyzed, and the impact the data has as a whole. Complementary to the methodology, the data analysis will explain why a thematic analysis was

used for this data, what themes emerged from the data, the impact of the themes and codes, and the further questions that have emerged from the data. Finally, the discussion will review critically the quality of this investigation, its validity, plans for future research, and the limitations of the research.

Literature Review

"Oh How We Have Grown,": Extended Realities

On April 1st, 1976, Apple Co. release a computer that would later change the ideologies and dynamics of the world, Downey (2016) explained, two years later the beginning of virtual worlds began. Although Downey documents virtual worlds to begin in 1978, Morton Heilig, a filmmaker, patented the innovation in 1962 while investigating new ways to immerse his audience for his films (Spear, 2002). With these innovations to society, the advancements of technology are in a constant state of change (Scott, 2015). These changes have paved the way for extended reality and the current generation of virtual worlds (Rickman, 2019; Downey, 2016).

Virtual worlds, specifically VR, belong to the larger class of technologies defined as "Extended Reality" (XR). XR consists of augmented reality (AR), allowing users to experience the "real-world" with overlaying digital content (Garden, 2017; Kishino, 2018; Rickman, 2019). For the gaming community, an example of AR would be PokémonGo. The PokémonGo game allows for users to use their camera showing where they are walking in the "real-world" but also digitally composing Pokémon characters as they walk along their path (apps.apple.com). This allows the users to experience the "real-world" as well as the virtual world at the same time. However, with VR, this virtual space is entirely constructed as a digital world, allowing for the players to be completely immersed within the simulation.

While XR is an all-encompassing virtual space for AR, Mixed Reality (MR), and VR; VR has been the focus of many researchers due to the level of immersion and possible effects VR could have on participants (Beals, 2010; Dahlquist et al., 2009; Stafford, 2005). A Study of medical students and their treatments to virtual patients in a training simulation suggest that the students were experiencing intense emotions from the simulation when their virtual patients died (Stafford, 2005). Stafford's (2005) article illustrated a level of participation within the simulation where the user became so committed to their role in the simulation it caused them pain afterward. Many researchers have attempted to review this level of participation by determining the level of presence and immersion a participant has within the simulation, however, the level of presence and immersion seems not be the only factor that allows for participants to experience emotion from a simulation (Adame, 2019; Annie Jin, 2011; Arriaga et al., 2008; Barberia et al., 2018; Bréchet et al., 2019; Dahlquist et al. 2010; Jennett et al., 2008; Jin, 2009; Makransky et al., 2017; Schuemie et al., 2001; Sekimoto, 2012; Steed et al., 2016; Suh et al., 2011; van Loon et al., 2018). These researchers have indicated that their participants reported a sense of belonging or autonomy to the simulation, specifically when speaking about their first-person experience within the simulation, by referring to their media character or video game character as "I" (Barberia, et al., 2018).

As researchers continue to investigate presence and immersion within VR, I have focused on the phenomenon of character adaptations in VR. This has lead me to review theory on identification and liminality, to better understand and explain how participants were moving in and out of these character roles in VR.

"Come on Guys, It's Identification!": Identification in VR

Virtual spaces have many avenues where participants can experience their VE, XR (AR, MR, VR), understanding how an individual adapts to a VE becomes vital to understanding the application of VR as technology advances (van Dam et al., 2018). Although the process of how a participant moves in and out of a VE as they take on a new character role has yet to be determined, an explanation of what the process is called is revealed within the research.

Identification is defined as the "mechanism through which audience members experience reception and interpretation of the text from the inside, as if the events were happening to them," (Cohen, 2001, p. 245). Cohen (2001) explains identification as a process in which we see the world through the character's eyes, we interpret the world as though we are actually feeling it for and through the character, however is not to be confused with identity, as identity is not so easily swayed to change the perception of oneself. For example, think about the last time you cried during a movie, those feelings were not yours, you did not experience whatever event that made you cry, but you cried anyway. Those are the feelings you take on and believe that the character was feeling when the event was happening. These experiences of identification are not new to use as moviegoers, TV watchers, radio listeners, etc.; however, when placed within an immersive environment, the experience of identification becomes a rich one.

Understanding identification, as it pertains to VR, allows researchers to view aspects of presence and immersion with a new ideology. As mentioned before presence and immersion are positively correlated with one another (Sekimoto, 2012), however, researchers have also reported that their participants have felt autonomous with their avatars while feeling present and immersed (Barberia et al., 2018; Gualeni, et al., 2018). Looking at the findings from the research apart from presence and immersion, it seems that the participants within the research have experienced identification by Cohen's (2001) definition. This connection proves important, as it

seems to have a strong impact on the research of presence and immersion; this could also be the possibility of identification being connected with the establishment of presence and immersion.

It is not a fact that identification has an impact on presence or immersion, however, the impact that identification has on virtual spaces is great. As mentioned before, Stafford (2005) reported that medical students within a study experienced intense emotions after losing a virtual patient in a training simulation, with Cohen's (2001) definition, identification has an impact on the medical students outside of the virtual space. The use of identification within virtual spaces is impactful as the en-roling and de-roling of the character within the simulation have an influence on the user and how that user will be effected in and out of the simulation.

With the understanding of identification, its definition, and its utility within virtual spaces, studying how and when a user is identifying within a simulation proves useful to understanding how users of VR en-role and de-role from their character roles.

"What is This Place?": Liminality and VR

Identification has shown to have a great impact on the VE, however, there is a period of nothingness within VR that also has an impact on the user. This concept of nothingness is coined as liminality (van Gennep, 1960). van Gennep (1960) used this term to describe the rituals of African tribes as they move from one position in their life to another. van Gennep (1960) explained liminality in three stages, the pre-liminal as a state of childhood; the liminal as the state of nothingness; and post-liminal as the state of societal acceptance (van Gennep, 1960). For example, a Jewish child is in the state of pre-liminal until they reach the age of 12, then they are placed by their Jewish society in a liminal stage until they can properly perform their bar mitzvah, and when this happens and the congregation accepts their performance, the child is placed back into society as a Jewish adult and reacts the post-liminal stage. Although van

Gennep (1960) looked more at the rites of passage for African tribes, the modernities of liminality have allowed for less ritualistic practices as the passage from pre-liminal, liminal, and post-liminal.

Although liminality in van Gennep's (1960) ideology is not fitting for VE's and VR, Thomassen (2014) coined the latest modernity of liminality called the limivoid. Thomassen (2014) refers to the limivoid as the pre-liminal and the liminal stages, however, does not refer to the post-liminal as in his definition, the post-liminal is death. Thomassen's (2014) example of the limivoid is a bungee jump, we are pre-liminal when standing on the bridge, liminal when falling downward, and if the cable snaps and we fall to our deaths, we are post-liminal, but if we snap back up and come back to the bridge again, we return to the pre-liminal. Thomassen's (2014) example of the limivoid is extreme when applied to the virtual space, however, it can be used as the similar example. For example, before entering into VR we are pre-liminal, while we are waiting for the game or simulation to begin we are liminal, and when we are in the game and discovering who we are as a character and character role we are liminal going into post-liminal (Gualeni, et al., 2018). Limivoid is applicable within the virtual space without the consequences detailed by Thomassen (2014) and has the potential to help explain character adaptation within VR.

Liminality, specifically the limivoid, applies to the virtual space by allowing the user to begin the VR simulation as themselves, enter into the simulation in a period of nothingness, and exit the limivoid as the character role they enact in the simulation (Gualeni, et al., 2018). Liminality and VR establish a connection in the VE for users to en-role into their character roles and de-role from their character roles, however, the process of de-roling has little research and its counterpart en-roling has never been researched.

"I'm Still Trying to Figure Out if This is Real.": De-roling

Character roles while in a VE have a strong presence on the users, these character roles allow for the user to become immersed within the environment (Gualeni, et al., 2018; Stafford, 2005). Although there has been little to no research on how users of VE's get out of the character roles in VE. Stafford (2005) has defined the process of relinquishing a character role as, "de-roling allows the participants to discard aspects of the role which may have been taken on, including inappropriate responsibility, and to restore them to a sense of who they are," (p. 1084). While identification, presence, and immersion all have an important impact in understanding immersive environments in VR, allowing for the user to be restored to their natural state is crucial in utilizing VR in society as a whole.

Gualeni, et al., (2018) have also discussed de-roling within VE's, and explain that the process of debriefing is not the same as de-roling, they review research on Live Action Role Playing, (LARPing):

> Though she does not use the term 'de-roling,' Stark does state that the first step of a
> debrief must be to 'a little ritual to help people say goodbye to their characters or get out
> of character.' (ibid.) In a deliberately open-ended list, she suggests that this may be
> achieved by means of techniques such as asking players to literally disrobe themselves of
> their character by placing a costume item associated with the character on the ground, or
> by providing a countdown before the return to the actual domain (therefore, we might
> say, establishing a temporal threshold between worlds) (p. 8).

Using the technique suggested by Gualeni, et al., (2018) may however be similar to the LARPing technique of debriefing, or bleeding, users of VR are not able to take off or disrobe from their character roles as easily.

Gualeni, et al., (2018) and Stafford (2005) have recognized the similarities in debriefing and de-roling, and strongly suggest the process of de-roling is a separate concept of debriefing. De-roling is the main component of debriefing (Gualeni, et al., 2018). The process of de-roling allows for the user to disassociate themselves from the character role completely and allows for user to come back to their original emotional and psychological state. While debriefing is the process of coming to a consensus with the emotions the user was feeling within the simulation or the environment they were in.

With the literature gathered on identification, liminality, and de-roling, an understanding of how a user of VE's or VR might attach oneself to their character roles proves to be an important aspect of understanding the utilities of VR as they become more integrated with society as a whole.

Methodology

Participants

The participants of this study were recruited via email blast to a Southern California University Communication department (e.g., **Appendix A**). The participants all participated in this study voluntarily and were informed about the aim of the study using a consent form. Participants of the study received $20 for their participation and were allowed to leave the study at any time without consequence. Six participants signed up for this study, two women and four men.

Setting

The setting of this study was conducted in the basement of the library at this Southern California University and was accommodated by the Academic Technology and Innovation

(ATI) VR lab. Participants were guided into an open room with two sliding glass doors and were asked to stand in the middle of the room.

The room was open for the participant to see and have access to all necessities, bathroom, chairs, and tables. This space was accessed with the help of the facilitator of this study and the voluntary participation of the administrator of the VR lab.

Apparatus

Oculus Rift

The hardware used for this study was an Oculus Rift, provided by the ATI VR lab. The hardware was permitted to the study with the supervision of the VR lab administrator and the facilitator of the study.

Lone Echo

The software used for this study was a program called *Lone Echo*. The program allowed the user to play as an automaton in space. The goal of the program was to fix a space station with the help of the antagonist in the simulation.

Data Collection

The data for this study was collected by asking participants to participate in a VR experience. Participants were allowed 45 minutes to play a virtual simulation game and asked to play as much of the simulation within the allotted time. Participants were also informed that they did not have to play the full 45 minutes and could stop the simulation at any point in time. Participants were then situated within the simulation and asked to complete the training the simulation provided.

During the time the participants were in the simulation, I sat in the back of the room and observed the participants while they moved physically and virtually in the simulation. I took

field notes of the participants while they were playing, writing all and any information that was interesting to the behavior within the simulation and outside of the simulation. After the participant completed the allotted time in the simulation they were asked to stop where they were and remove all equipment.

The participant was then asked to participate in an hour semi-structured interview explaining their experience within the simulation. The participant was given a list of possible questions that might be asked, however, the interview would move with the participant and what they were willing to share about their experience. The interview was recorded using an audio recorder to be transcribed at a later date. The interviews were structured for an hour, however, some participants were unable to continue the interview and left before the time.

The audio recording was later transcribed by myself, where I spent time in isolation writing all statements on a word document. Some components were not transcribed due to the participants stuttering, laughing, coughing, sneezing, etc., however, a note of this was made within the notes of the transcription.

Data Analysis

As mentioned the setting was accessed by the facilitator of this study. She was allowed to give me privileges to the VR lab at this Southern California University because of her work with the ATI department and her continued work with VR.

I established rapport with participants of this study by speaking with them before the study and giving an explanation of what the study will entail and assuring there would be no danger to the study and could leave the study at any time. I also provided participants with water and snacks or food. I wanted to provide them with water and food due to the length of the study, I felt that the length of the study was long and wanted the participants to feel comfortable in the

setting. I also provided the same water and food for the administrators in the VR lab, for giving me privileges to their equipment and any/all troubleshooting.

I felt that providing the food and water for my participants gave them a sense of feeling comfortable within the setting. Food is something that makes anyone feel at home or comforted and water is a basic necessity, so given the amount of time that the participant was going to be participating in the study, I wanted to make sure that their basic needs were being met. I don't feel that providing these necessities was biasing my participants or coercion them in any way. I believe that giving my participants what they needed to function only allowed them to participate in the study a full capacity.

Some ethical challenges I faced in this study were not completely being aware of a participants mental state. A participant within my study revealed in the interview that they were a person with disabilities and some of the feelings they were experiencing during the interview were similar to some they had felt during a time of their depression. This was something that was noted within the field notes taken during the interview and discussed with my supervisor of the study. I followed up with the participant to double-check on their mental health and ask for any recommendations they had for future participants of the study. They suggested that having resources for the participants in case they had experienced those emotions and make sure to add an emotional risk to the informed consent. The follow up interview with the participant was to make sure they did not want to harm themselves or felt depressed or in a negative emotional state due to the study. The participant reassured that they were fine and that they were not feeling bad, depressed, and did not want to hurt themselves. I have provided that participant with the resources that are free and accessible to them as a precaution. Revisions to the study's consent form have been sent to the university's Institutional Review Board (IRB) for modification.

Reflexivity

As I was making my way through the study some aspects of the study came into my mind, I was curious to understand if this study would have a bias. I asked myself this question because the majority of my participants within the study were men, and were somewhat into the gaming world and culture. This was something that I thought of because I didn't think about how women would like to participate in the study, as far as identifying with a male automaton. I think that this might have happened because when I came up with this study I was thinking about how I would be able to make a difference in the world be illustrating character adaptation for society as a whole and as a male myself, I guess I placed myself at the center of society. I think being able to assign the gender that best fits the user is a clear way of allowing the users to become more immersed within the simulation. Although this is not functional with *Lone Echo* it is something that I will make sure to consider for further qualitative study on character adaptations.

I would not say that I have a gender bias within this study, however, I would say that I would like to have a program that allows the user to choose their preferred gender before they participate within the game. I made sure to place their preferred gender pronoun on their informed consent packets however I did not think about the implications of the simulation. This will have a stronger impact on those who do not identify with the character if they do not identify as male.

However, I made sure that all my participants knew that I was not their superior within the setting and I was not able to order or demand them to do anything that they do not feel comfortable doing. I wanted to make sure that they knew this right away so that they felt comfortable within the setting. I also made sure to use profanity in front of them to let them

know that saying words like that was ok. I also told them directly that using profane words was ok.

Data Analysis

"Do you want me to tell you how I felt when I was doing it?": Initial Coding

After the audio recordings were fully transcribed, the transcription was uploaded to a qualitative analysis software called Atlas.ti. After the transcription was uploaded, I began to code the data. Initially, I coded the data line by line, using a thematic analysis approach to the data. I wanted to make sure that I was capturing exactly what my participant was saying when first reviewing the data. Some of the codes that I came up with were "obstacles that made the game less immersive," and "curious to know the consequences." These were coded items that came from the data directly. These codes provided context to what my participant was saying when first looking and review the data. Although when I stopped coding line by line and started looking at patches of my participant's statements, I found codes like "character adding detail," very often. My participant said the "character adding detail" through the transcript and gave an understanding of how he was trying to search and understand the virtual world he was in as a whole and how it was pertaining and/or relevant to him.

With this new understanding of how I could approach this data, I continued my initial coding looking at phrases and statements my participant made within the transcription. However, the participant made statements like, "you start to like, you really feel immersed," in which I could only really code this statement as "he felt immersed." I went through the transcript finding these statements within the data and found this to be extremely interesting. This participant had much knowledge of the gaming world and its functions, throughout the transcript he made judgments to the quality of the program and the hardware but would make statements about

feeling very immersed within the simulation. I found that when initially listening to the recording, he was almost wanting to fight the realization of being immersed within the simulation.

The thematic analysis approach to the data helped illustrate these outliers within the data. Since I was able to review the data initially as what my participant was saying, I was able to see how the participant was feeling about the simulation and make the codes that corresponded to that part of the data. However, when looking at the portions of the data when the participant was critiquing the quality of the simulation or even myself as a researcher with statements, "yeah , good experience. Do you want me tell you how I felt when I was doing it? Is that a follow-up question?" This came to me as a verbal code of defensiveness. My participant finished being in the simulation for 45 minutes and this was the first piece of data within the transcription. I didn't know how I would be able to give this a code outside of what he said on the transcription however via audio, this initial code was one that was almost defensive as if he was guarding himself against me as a researcher. This was an interesting audio code that came from the data.

Although my participant tried to guard himself against what he thought would be a sense of the character, when referring to the simulation he kept using the word I, "Oh I was just trying to be real slick, and trying to maneuver everywhere. And then I miss something and I was like 'damn.'" This was interesting factor of the data and showed throughout the transcript. The participant referred to the actions he was doing within the simulation as the character as "I" throughout the data. Using the theory of liminality and identification I was able to then further code and group the data using a categorical method of analysis, however still using thematic analysis.

"Where Am I?": Sub-Categorical Grouping

Gathering all initial coding together, I was able to start grouping my codes into some themes that I found within the data. Before I grouped the codes, I reviewed the codes for patterns and themes that might have emerged from the data and came up with eight code groups. Some code groups have extensive amount of codes, as the data showed a clear indication and focus on this aspect of the simulation, however, the coding groups are labeled as; Character, Feelings, Presence, Immersion, Nothing, Outside the Game, What is that?, and Where am I?.

Character

The character code group consisted of codes that pertained to the development of the virtual character. The code group comprised all the details of the simulation and the characters that are part of the simulation. As mentioned before, the participant made statements within the data that illustrated him as being the character. This code group gathered those illustrations of the participant's character and the setting within the simulation together to comprise this code group.

The character code group, using the theory of identification, showed how the participant trying to identify within the simulation. The participant went to great lengths to understand the environment and his character. Although when the participant began to explain the character dynamics of how his character and the other characters within the simulation interact, the participant added a hierarchy to the simulation. This explanation of a hierarchy within the simulation showed the extent to which the participant was adapting to the character and seeing the world in which the character inhabited as his own paradigm of life, giving indication of identification within this code group.

Feelings

The code group feelings illustrated how the participant was experiencing the simulation. The participant expressed feelings and experience while participating in the simulation as a

reaction to the characters, events within the simulation, and obstacles they faced while playing the simulation. I created this code group by reviewing the participant's codes that indicated accomplishment, confusion, excitement, exploration, and reaction to experience in the simulation.

The data in this section expressed many different emotions that I wanted to make sure that I could capture the experiences without narrowing the data and taking away from what is being expressed. The theory of identification and liminality apply to this code group. Identification reflects upon this code group as it illustrates that the participant is experiencing emotions and experiences through the paradigm of the media character within the simulation. Liminality illustrates this code group by explaining the participant's expression of experience. The participant explained his feeling of being in outer space, however, they began to explain that it was only what they have seen in movies and if that's what it looks like, it was pretty real. This explanation of his perception of the simulated experience draws on liminality by illustrating a knowing and a not knowing, by moving from one liminal space to the next, however, still not sure where he is.

Presence

The code group presence explained the sense of being the simulation. This code group gave an understanding of the codes that explained how the participant saw the aspects of the simulation. This code group not only explored aspects of the simulation but also of the participant in the "real-world." While participating in the simulation the participant moved backward in the room and when finished with the simulation, they were surprised to see that they moved around in the "real-world." The participant explained the sense of being there as, "because like when you look back you literally see the back of the spaceship, you know you

don't see the back of yourself. You see the back of the spaceship, and that adds to a point where it's just like a change from 3-D to 4-D."

While developing this code group, I found that the similarities with its sister code group, immersion, share almost all of the same codes and using identification theory, the explanation of "being there" was illustrated with the participant's perception of the character and the setting.

Immersion

As mentioned with the presence code group, immersion and presence share almost all of the same codes. This finding was not surprising as the research showed that presence and immersion are positively correlated with one another in the VE. However using the definition from Slater (2003) for immersion as the "real-world sensory modalities," the codes in this group touch on what the participant believed to be "real-world:"

> Because you know that 3-D you see everything you feel like it's coming at you, it's pretty cool. But then at 4-D you start like feeling like, there's the Shrek thing at Universal Studios, like the show, where they have the 3-D it starts, and then in the middle of the chairs start moving and then there a water thing and then actual water comes on you. So it started feeling like, damn I'm low key apart of this.

As the participant illustrated, this "real-world" feeling, came from feeling apart of the simulation.

Using the theory of identification, this coding group details the participant's feelings of being within the simulation and perceiving the simulation as being "real-world" by explaining the paradigm of character as he sees the simulation to be "real."

Nothing

This code group explains the codes that pertain to the data as not being anywhere. These codes showed that the participant was neither within the simulation nor within the "real-world" however, were in a space beyond what was tangible.

The theory of liminality explains this by suggesting the existence of a space where you can exist and not exist at the same time. The participant illustrates this explanation by explaining his thought process of the path he is choosing within the simulation, "the end goal is the same, the starting point and ending point is exactly the same, it's just what you do in the middle you can pretty much do whatever you want."

Outside the Game

Outside the game, code group focused on aspects that the participant believed were outside of the control of the game. The codes illustrated the outside factors that effected the participant's sense of the game and sense of "being there" or "real-world." The theory of liminality explains the codes that determined this code group by explaining the transitions from liminal stages. While the participant moved within the simulation and was interrupted by an outside factor moving from a post-liminal stage to liminal and then pre-liminal. This transition between liminal stages restarted the process of identification and liminality, "I kept hitting the headset with my hands because I thought had more space, but I didn't."

What is That?

The group code, what is that?, gathered the codes from the data that illustrated the participants not knowing what will happen within the simulation. Although there were not many codes within the data that gave this interpretation of the participant, it was significant enough to group these codes on this understanding. "Honestly, I was just curious what game we were

gonna play," was coded as, curious about the game, and grouped into what is that?, by the curiosity of the simulation and how it will impact the participant.

Liminality also explains this code group by placing the participant in a state of anticipation or expectancy. By that, the participant is in the liminal stage waiting to enter or exit from the simulation.

Where am I?

The where am I? code group came from the collection of codes from character, immersion, and presence. This was one of the most interesting code groups within the data set as it revealed itself when interpreting the data and seeing that the character, immersion, and presence code groups all had similar codes however were missing an aspect that was not yet grouped or coded. Where am I? code group helps to understand the missing information from that by using the theory of identification and liminality to illustrate the missing of oneself while moving into a character role and forgetting for a short time who you are as you play the simulation.

The participant found it extremely interesting when he was moving his entire body while in the simulation when he thought he was only moving within the simulation, "yeah definitely, but I didn't think I was using my feet, I thought it was just my hands and thrusters and stuff that I was using. I guess I was using my feet in real-life and didn't even realize it." For this reason, the code group, where am I?, was created.

"I Can See How It's Identification Now": Categorical Grouping

From my initial coding process and coming up with groups to understand these coding schemes better, I came to the understanding that the themes within the data established more

concepts than themes. After reviewing all codes and coding groups, I concluded three concepts that emerged from the data, Liminal, Identification, and Emotions.

Liminal

The category of liminal emerged from the code groups, outside the game, where am I?, and nothing. It was not a surprise that this category came from the data. However, looking at the code group where am I? and what s that? I found that the relation between the two to be similar but when looking at the final categorization of the two code groups the data appeared to push them in different directions. The liminal category is fully supported by outside the game as the code group illustrates factors that influence users to move to and from different stages of liminality. Also, the nothing code group greatly supports the liminal category as the code group nothing is a stage in liminality called the liminal stage.

The liminal category group suggests a stage in the research that suggests that a user of VR or VE's must be able to achieve a liminal stage before they can achieve en-roling into the character role. The codes supporting each code group that make up this category are instances in which the participant of this study have encountered to achieve the liminal stage and then move onto the post-liminal stage of the simulation.

Identification

A final categorization of identification emerged from the data when analyzing code groups immersion, presence, and character. Although I do not find this category to be surprising, the codes that support this category are very interesting. While reviewing the codes that make up each group, I found the codes are shared in almost every code group that make up the liminal category. This was interesting as the first conception of the data would suggest that being in a

liminal stage came before a user of VR could identify with the simulation but this is not what the data shows.

The data details that the liminal stage and the process of identification work together while the user is en-roling to their character role. The user experiences the nothingness stage of liminality while simultaneously experiencing en-roling, suggesting that a user of VR is becoming nothing as they are also beginning to experience identification or adapting to their character role simultaneously. I believe that this is the process of en-roling within VR.

Emotions

This final categorization of emotions emerged from my data when looking deeper into the code groups, feelings and what is that?. This came as a surprise within the data as the what is that? category did not strike me to be one involving emotions, however, it showed to be just that. While feelings is more of the emotional and experience of the participant within the simulation, the what is that? category stimulated the participant's intellectual reasoning within the simulation. This was incredible to me, I would have never thought that suggesting a category that mainly focused on logic and reason could have such a great impact on the emotional aspect of a VR simulation.

These findings were also very impactful as they seemed to be the result of the identification category. The emotions category seem to fuel how the participant identified within the character role in the VE and was determined by the participant's level of understanding or reasoning with their identification to the simulation.

Discussion

Although the process of en-roling and de-roling still needs further investigation, a suggestion to the process of en-roling and de-roling can be inferred from this study.

The data analysis of this study infered three main categories that emerged from the data as being essential to the process of en-roling and de-roling; liminal stages, identification, and emotions. As users of VR move into the simulation they experience the stages of liminality, pre-liminal, liminal and post-liminal. However, the stage of nothingness, where the user is neither their original self before entering the simulation nor the character role within the simulation, but are simultaneously being filled with the character role as the extend of the liminal stage begins to dissipate. This process is one that can be inferred from the data as the process of en-roling within VR. Furthermore, as the user begins to de-role from the simulation they are simultaneously losing their character role as they enter back into the liminal stage. This is the process of de-roling from VR.

As identification happens within the simulation the user that is en-roling is taking on emotions and logical ideologies as they begin to adapt to their character role. This has been mentioned by Stafford (2005) and Gualeni , et al., (2018) in their investigations of de-roling and de-roling practices, although the process of de-roling must have a counterpart to its process and by that the process of en-roling must be recognized.

This investigation of character adaptations in VR has given insight into the factors that affect users of virtual spaces. The production of this study critically investigated the phenomenon of en-roling and de-roling from VR and although this study has given insight to that process, conducting a controlled experiment will give statistical validation to developing the practices of en-roling and de-roling. The statistical validation of a quantitative study can generalize the practices of en-roling and de-roling for the general public and can set a repeatable experiment for other researchers to repeat in their setting and expand on the phenomenon or enhance the practices as technology moves forward.

The validity of this research relies on the participants of this study who have examined the write up of their data and agree that the information presented in the paper accurately represents them and their experiences within the study.

The limitations of this study are the participants sought for the study mainly being university students between the ages of 18-30 and mostly males with interest in gaming and technology. Expanding the study to include those who are not university students, including more female participants and a wider range of participants between 18-50 years of age could give more of a generalization to the study.

Although the limitations to this study have some drawbacks to the explanation of en-roling and de-roling as they seem to only pertain to a particular culture group of university men, the investigation of this study used the experiences of those who were willing to share their experience of character roles within VR and how the roles they took on affected them. This study is still on-going and more data collection is planned to be gathered to fully understand the processes associated with how users of VR en-role and de-role from a VE. Plans to conduct a quantitatively based experiment investigating character adaptations in VR yield this study.

Appendix

Appendix A: Email Blast

VIRTUAL REALITY STUDY

This study has been approved by the California State University, San Bernardino Institutional Review Board

PURPOSE OF STUDY

This research project is to study how participants experience character identification and immersion in virtual reality environments.

DETAILS OF STUDY

Students participate in a virtual reality simulation and an in-depth interview answering questions and sharing their experience.

STUDENT BENEFITS

Students will gain a monetary benefit from $20, and the experience of being a part of cutting edge research.

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