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Master's Thesis
Academic Year 2022

Investigating Identity Formation in a Virtual
Reality Narrative Experience: Becoming Your
Ideal Self



Keio University
Graduate School of Media Design

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A Master's Thesis
submitted to Keio University Graduate School of Media Design
in partial fulfillment of the requirements for the degree of
Master of Media Design

Jiarui Zu

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Abstract of Master's Thesis of Academic Year 2022

Investigating Identity Formation in a Virtual Reality Narrative Experience: Becoming Your Ideal Self

Category: Design

Summary

Virtual reality has grown into a stimulative, cognitive, and embodied tool for the psychological field. Multiple studies have been done investigating the neurological and psychological mechanisms involved in VR. The distinct feeling of presence and body ownership illusion in VR had been shown to be useful in mood improvement and cognitive reconstruction, which can also influence the formation of users' narrative identities in VR. To investigate identity formation mechanisms in VR, 2 pilot studies were done testing factors that trigger self-detachment and out-of-body experience; "seeing oneself as a third-person" was reported to be an influential factor, linked with greater self-awareness. I proposed a VR narrative experience called "becoming your ideal self", which allows the participants to immerse in VR with their ideal self avatar and complete a mission using the social VR platform VRChat. Participants also did a reflective talk with their current self avatar inside VRChat. After this experience, participants rated themselves better in self-awareness and mood state. I also did a qualitative analysis with the interview materials I obtained. This experiment demonstrated an example of how social VR platforms can be applied not only for entertainment but also for our identity formation and personal growth.

Keywords:

Virtual reality; human-centered computing; human computer interaction (HCI); psychology; full body ownership illusion; identity formation; self-awareness; self-talk; mental health; perspective taking; roleplaying; narrative identity;

Keio University Graduate School of Media Design

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Chapter 1

Introduction

1.1. Background and Motivation

Mental health has long been one of the increasing issues in modern society. Although technology develops and our lives are becoming more and more convenient, people seemed to get worse at dealing with mental problems. In 2020, the Covid-19 outbreak made the situation worsen [1]. How come technology development did not make us happier? In what ways should we design our interactions with this high-tech environment so that our mental health can benefit in a positive, sustainable way? Those are the questions I would like to research initially.

During the pandemic, we are facing the increasing need for psychological treatment like personal counseling, this need cannot be met with the isolation situation that we were put into [1]. The resources for treatments are decreasing. However, as I researched more, I found there might be some hope to shine in the virtual world ahead of us. In fact, over the past two decades, virtual reality (VR) has emerged as an advanced tool for evaluating and facilitating the treatment of mental illnesses [2].

The extensive usage of VR in mental health fields is related to the unique feature of VR that provides the users a sense of "presence", which means you can have a sense of being present inside of the virtual world [3]. People tend to have a perceptual illusion of owning the virtual body if they see a life-sized virtual body from the first-person perspective and this illusion will be reinforced if the virtual body moves synchronously with their real body [4]. Existing research supports the clinical use of VR in the assessment and treatment of anxiety disorders, pain management, and eating and weight disorders, with long-term effects that generalize to the real world [5]. Recent studies have also provided preliminary support for the use of VR in the assessment and treatment of psychosis, addictions, and

autism [5].

Since Facebook’s announcement of ”Meta” in 2021, the concept of a universal, immersive, futuristic virtual world had again been brought to public attention. Despite how controversial Meta was, virtual reality as a well-developed technology indeed has the potential to create space for socializing, playing, working, learning, and having new experiences without time and physical boundaries. As we moved into the 2023 post-covid era, we can envision that 3D role games and online social interactions in VR will be an essential part of our lives in the upcoming years, especially for the young generations. In fact, we already have multiple virtual identities nowadays, we play as heroes in games, and sometimes act as someone else on social platforms. But I would argue, a stable unified identity is still important for our mental development, different narrative experiences in VR has been proven to affect people’s cognition and self-awareness level [6].

In summary, compared to other media, virtual reality offers more options. With proper usage, it can have therapeutic effects for mental health related issues, and it can be a great tool in facilitating people’s psychological growth like cognitive reconstruction, self-awareness enhancement, self-actualization, and identity formation practices.

In the paper, I will be mainly researched on what are the key factors influencing the identity formation process in VR. To test one of the potential factors OBE (out-of-body experience), two pilot studies about out-of-body experience have been conducted before we made our final design. Based on the pilot studies and other previously existing studies, I proposed the figure - ideal future self, and a narrative of ”becoming the ideal future self”. I want my users to do a role play in VRChat as their perfect ideal self and they are instructed to make use of the ”worlds” available in the VRChat to finish one thing they would like to do if they become their ideal self. I believe the cognitive structuring process and positive reflection can happen while the person is immersed as the ideal self, and combined with a process of creating or overwriting self-conception with more positive attribution.

After this experience, participants rated themselves better in mood state and self-awareness level, which let my design become another possible interaction design reference in VR for mental health-related issues.

1.2. Contributions

Contributions of my master thesis are the following:

- * Discuss the identity formation mechanisms in VR;
- * Design self-detachment and self-talk interactions in VR;
- * Design a positive narrative usage for the social VR platform.

1.3. Structure of the Thesis

The thesis consists of 6 Chapters in total. Following this Chapter, Related Works about virtual reality in the psychology field, body ownership illusion, theories of narrative identity formation, the mechanism of self-identification with mirror in VR, and the concept of self-awareness were introduced in Chapter 2. Later in Chapter 3, the design process of the ideal self figure was introduced; two Interactions design, self-detachment, and self-talk were introduced; and two pilot studies about the out-of-body experience were done, and my final design proposal was made. Chapter 4 describes the whole experiment design, the hypothesis, and the procedure, and Chapter 5 describes the corresponding evaluations and results. The conclusion with possible future works is explored in Chapter 6.

Chapter 2

Related Works

2.1. Virtual Reality in Psychology

In general, virtual reality (VR) can be defined as "advanced human-computer interfaces that allow users to interact and be immersed in computer-generated environments in a naturalistic way". [7]

From a psychological perspective, VR is primarily a subjective experience that allows the users to believe they are there and the experience is authentic. To be specific, what sets VR apart from other media is "presence".

2.1.1 Presence and Body Ownership Illusion

Presence

So what is presence? The International Society for Presence Research today defines presence as "a psychological state in which even though part or all of an individual's current experience is generated by and/or filtered through human-made technology, part or all of the individual's perception fails to accurately acknowledge the role of the technology in the experience."

This presence, with skillful usage, was proven to be helpful for people with different mental health issues. A virtual environment gives people a chance to replicate things that happened in the real world with no physical harm. A different environment can be easily manipulated inside of VR and let people practice skills and build up strategies before they face difficulties in the real world [8].

Body Ownership Illusion

The biological mechanism behind presence is the phenomenon of body ownership illusion. In VR, people tend to have a perceptual illusion of owning the virtual body if they see a life-sized virtual body from a first-person perspective and this illusion will be reinforced if the virtual body moves synchronously with their real body [4]. Furthermore, we could even trick our brain to believe the virtual body is ours "biologically", this was called a body ownership illusion. One of the well-known studies in body ownership is the rubber hand illusion experiment [9]. The researchers stock a fake hand and the real hidden hand simultaneously for a while, participants reported they felt strong ownership over the fake hand that they saw in front of them, and they would avoid a hammer punching toward the fake hand. On the ground of this, cognitive neuroscientists and robot scientists got succeeded in letting a person without a right arm show regained activities in the parietal cortex that react to a fake hand, which means ownership toward the fake hand [10]. Body ownership refers to the perceptual status of one's own body sensations that seem unique to oneself, resulting in the feeling that the body belongs to "me" [11].

The body ownership illusion (BOI) can lead to changes in perception, attitudes, and behaviors [4]. Self-counseling in a virtual environment, through conversations between two virtual bodies; self, and self as Sigmund Freud, has been proven to be effective for improving participants' mood [4]. This mood improvement was greater when participants experience a synchronous movement with the virtual body of Freud, which facilitated the feeling of Freud embodiment, and a detachment from the original self. Similarly, researchers have found greater illusory feelings of full-body ownership when participants' movements were synchronized with the VB, and the facial expression of the VB can modulate participants' emotions [12]. A study has also proved a change in attitudes and cognition toward a different race group happened after the virtual embodiment of a character in that race [13].

Proteus Effects

Another demonstration of how virtual reality can change users' behavior is the proteus effect. The proteus effect describes the phenomenon that people will change their behavior and attitude in a virtual environment based on the appearance of

their avatar in the virtual world [14].

In one study, participants with more attractive avatars showed more intimacy with other confederates than those with less attractive avatars during self-disclosure and interpersonal distance tasks in VR [15]. Another study showed that during negotiations with confederates, participants who were given taller avatars displayed more aggressive behavior compared to people with shorter avatars [15]. So the height and attractiveness of the avatar will affect the player's performance. In other studies, factors like the color of the uniform, the characteristics of the avatar, and the clothing styles all affect the user's behavior [16].

The psychological mechanism behind the Proteus effect can be explained by the "self-perception theory", which states that people infer their attitudes and beliefs from observations of themselves like a third party [17].

2.2. Identity Formation in VR Narrative Experience

Identity formation is the psychological process by which people construct their own sense of self. Forming a healthy identity is associated with a continuous and coherent self-concept, whereas destructive and traumatic experiences affect how we view ourselves and our capabilities. Values and personality development are also related to identity formation. Certain factors such as race, ethnicity, and spirituality also play a role in this process [18].

Narrative identity theory by Dan et al. says individuals form their identity through integrating their experiences into a self-story and this story is constantly developing internally, with inner unity, logic, and purpose of their lives [19]. Since it is a story, it has a classical structure of beginning, middle, and end, and it also has characters, episodes, plot, imagery, setting, and theme.

In previous sections, I demonstrated that VR can provide a safe, manipulative, and immersive storytelling environment. The body ownership illusion mentioned above allows the users to behave naturally and feel control over the virtual body. This environment can be a perfect way for the users to experiment, reform, reframe, and eventually recreate their self-narrative. For instance, people with social phobia can practice their speech in a virtual setting, or rewrite their past bad

public speech memories [20]; people with eating disorders can build a strategy before the binge eating episode with proper coping rehearsal [21]. Studies had found VR narrative experience was beneficial for people with autism, addiction, rehabilitation, ADLS, and so forth [22]. Playful role-taking experience with digital characters also creates empathic identification toward the characters and a transformed sense of identity was found [23].

McAdams claims that we often unconsciously define ourselves with a heroic myth [24]. However, for people with unpleasant pasts and distorted self-images, the heroic myth may not be their best bet. In fact, other studies argued the most beneficial way is escaping from the traditional heroic narrative and developing perspectives that related to a specific person with a specific point of view [25]. The personal experience creation can lead to a new understanding of past events which gives meaning to each person with their own narrative line.

Again, VR provides the possibility for the rewriting and reconstruction of one's narrative identity. Based on the theory that experiences are a form of narrative that is part of the continuity of the self, the process of rewriting can create new meanings and change the explanation of past experiences, which changes self-perception, new internalized knowledge, and skill can be created during this process as well [26].

Other researchers also found narrative experience can be beneficial for overcoming traumatic experiences [27]. People with traumatic experiences tend to have the feeling of losing control over life. In psychology, we call this "learned helplessness". In VR narratives, they can regain control by using this manipulative environment and recognize they are still the one and only storytellers and experts of their own lives, with the help of professional therapists, they can rewrite their past bad memories, and turn their chaotic and incoherent life narratives into healthy and coherent ones [28]. This cognitive restructuring will influence and trigger changes in negative patterns of reality perception, which changes the person's self-narrative, and eventually help the patients to change behaviors in real life.

2.2.1 Self-identification in VR - Lacan's mirror stage

In a virtual reality (VR) environment, a virtual mirror display is often implemented, it has been used for different purposes, like e-shopping, fitness activities, psychotherapy, and confirmation for avatar embodiment [29]. The mirror can reflect the avatar to the user and enhance the embodiment and reinforce the body ownership illusion [30]. Users can observe the reflection of the avatar's full body image, including the face, and it provided a new perspective to interact with the avatar compared with the usual 1st person perspective [31]. Like in the real world, the synchrony of the movement between the virtual body and the reflective image in the mirror will trigger the user to recognize the virtual body as their own reflection. Studies demonstrated the most effective embodiment was induced when the users were reaching for objects around the face or touching the face, and users feel ownership over the face when they change their facial expression in front of the virtual mirror [29].

This psychological mechanism behind the self-identification process in VR can be explained by Lacan's mirror stage theory, which is based on Lacan's reinterpretation of Freud with the main focus on language [32]. In his essay titled "The Mirror Stage", Lacan developed the concept of the mirror stage, which occurs between 6-18 months of a child's development, when the child begins to differentiate between self and other, as he encounters an image of himself the mirror. Before that, the child is in the Real stage, driven by needs, living with the mother. During the mirror stage, the child achieves bodily autonomy for the first time. Thus begins the lifelong process of identifying oneself in terms of other men/women, West/East, etc. The mirror stage is not only a passing stage of human psychological development but also a model of the relationship between the "I" and its image.

In summary, a mirror implementation in VR is important not only for users to recognize the synchrony between the avatar and themselves and make the connection between self and the avatar, but the mirror also served as a tool for a psychological purpose so that users in VR will identify with the avatar cognitively as well.

2.2.2 Identity Formation and Self-Awareness

Identity formation can be tested using self-awareness scales. Being more aware of who you are is developing a deeper understanding of your core identity. For a specific definition of self-awareness, psychologists Shelley Duval and Robert Wicklund proposed: "Self-awareness is the ability to focus on yourself and how your actions, thoughts, or emotions do or don't align with your internal standards. If you're highly self-aware, you can objectively evaluate yourself, manage your emotions, align your behavior with your values, and understand correctly how others perceive you." [33] In short, those who are highly self-aware can objectively explain their actions, feelings, and thoughts.

There are two different types of self-awareness: public and private.

Public self-awareness cares about how we appear to others. Due to this awareness, we are more likely to conform to social norms and behave in a socially acceptable way. While this awareness has its benefits, it also has the risk of falling into self-criticism. People who are particularly high in this trait may spend a lot of their time worrying about what others think of them. [34]

Private self-awareness is the ability to become aware of and reflect on one's own inner state. People with this trait have an intimate sense of self. They are introspective and curious about their own feelings and react to things with curiosity. For example, when they find themselves getting nervous while preparing for an important meeting, they will focus on noticing bodily sensations and appropriately attributing the feeling to meeting anxiety. [34]

Virtual reality provides opportunities to repeat the same experience in a consistent manner and in a secure environment. This facilitates participants to self-assess their situation and helps them to improve their self-awareness level [7].

Chapter 3

Concept and Approach

3.1. Concept of the System

Initial proposal

Evidence from the above chapter demonstrated evidence that we can immerse into other characters and live like someone else in a virtual environment. Since we have tried to feel different bodies and souls and got a better understanding of others, why don't we use VR to know ourselves better? With this initial question, I raised more questions like how can we interact with ourselves in VR and what kind of interactions should we do so positive results can be made.

Initially, I came up with a proposal of the figure - ideal future self, and a narrative of "becoming the ideal future self". I wanted my users to do a role-play in VR as their ideal self, and after the role-play, I would like them to do a reflective talk with their current self.

3.2. Ideal Future Self Figure

Firstly, In order to interact with ourselves, we need to create another "self".

Previous research showed ideal future self is a good reference for people to relate with [35]. Studies have shown that a positive image of your ideal self leads to an increase in positive moods [35].

What are the benefits?

An ideal self figure has been defined as a concrete representation of our goals, a gathering of all the good possible futures people can imagine for themselves [35]. Allport et al. defined it as the gathering of "most cherished self wishes" [36]. We know this figure is better, stronger, and more experienced than we are right

now. These imaginary exercises will allow people to gain meaningful insight into themselves and give them a feeling of control. Imagining success in the future can improve performance, boosts psychological adjustment, and result in a variety of positive thinking [35].

People tend to feel distanced from their future selves. Studies have shown that brain activities are more similar when people thought about their future selves and when they thought about a stranger, compare to when they thought about their current selves [37]. Self-continuity, the ability to connect with the person we will become, can be really important for better self-awareness and self-regulation skills and less procrastination behaviors [38]. Imagine one's ideal self linked with improvement in building a self-continuity image and self-regulation skills [38]. The ideal future self would have accomplished things that the current self wants to accomplish. This figure can give people a better understanding of the priorities of their goals and values [39]. This imagination training gives people the chance to learn about themselves, illuminate and reconstruct their priorities and gain better insight into one's motives and emotions. One study showed after people see an older picture of themselves, their saving behaviors increase [40].

How to imagine your ideal future self? What kind of techniques are there?

In clinical psychology, there are different strategies used in creating an ideal future self figure. Some experiments used "the miracle question", a popular intervention in Solution-Focused Therapy, which asks the client to imagine and discuss a possible world where problems are removed and issues addressed [41]. Other psychological imaginary interventions, such as "the best possible self", foster optimism about reality by describing a person's striving process to achieve the best possible outcome in life [35].

These strategies had shown effective results, however, they tend to ask big-scale questions and the imaginary outcomes could be abstract and lack of specific details and characteristics in real life. To avoid thinking too big, we purposed our own ideal self-imagination training.

I would give my participants instructions as follows: "I want you to envision a few years have gone by, and all your dreams and hopes have come true and all the problems are gone. You are at your top form. Now try to ask a few questions to yourself. Where do you want to be right now? Who do you like to meet right

now? What kind of clothes you are wearing? How many years passed?”

Answering these questions may reveal how unique your personal aspirations are. Your expectations of yourself can be very different from other people’s dreams. You may also find that your ideal future self is within reach. There may be many characteristics in your life now that you have chosen not to change.

Physical appearance of the ideal future self

To design the appearance of the ideal self figure, I did a 50 people survey, 65 percent of people said the ideal self they visioned was the appearance after they used a beauty filter, instead of an elderly appearing figure.

What kind of interactions should the ideal future self do you inside of the virtual environment?

Other than role-play as the ideal self in VR, there are two more interactions that I was interested in exploring: self-detachment and positive self-talk.

3.3. Self-Detachment and Out of Body Experience

Self-detachment is the term I used to describe the psychological mechanism during an out-of-body experience. An out-of-body experience (OBE) is the sensation of being outside of one’s physical body, with the experience of ”seeing self”, and it’s a form of autoscopy [42]. People might experience OBE because of chemical, mental, and mechanical inductions [43]. This paper will mainly focus on the ones that were induced in healthy people and in a laboratory environment. OBE is a complementary experience for body ownership illusion, the feeling of owning a body or body part other than your own [43].

Perspective-taking, which means seeing yourself from a third-person perspective, can also lead to cognitive changes toward oneself because of the detachment from habitual ways of thinking [44]. A detachment from your body and role-play with someone else can lead to a shift in ways of thinking, a change in reasoning, and a growth of problem-solving skills [45]. Different perspective-taking can be easily conducted in a virtual environment. In our design, we assume seeing yourself in VR from a third-person perspective will create a detachment from your original self.

3.3.1 Pilot Studies Related to OBE

Pilot Study 1

In this experiment, we tested what triggers the feeling of an out-of-body illusion with a simple setup. Participants were asked to lie down with heavy covers that restrict the movements of their bodies or just sit down. Then they wore a single-eye Hacosco cardboard with two phones connected through FaceTime. The other phone was controlled by the experimenter with a selfie stick. See Figure 3.1

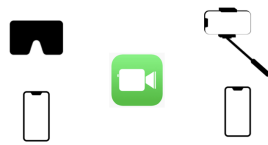


Figure 3.1 Pilot study 1

The experimenter chose to either move the camera from the participant's first-person perspective (which means moving the camera like the participants would move their eyes daily), or from a third-person perspective, which means the camera will shoot the participant from a 3rd-person-perspective constantly. See Figure 3.2

The point of this experiment is to let the participants see from the point of view that they usually do not see themselves. So in the first-person perspective situation, we end the experiment with a sudden switch to the 3rd-person-perspective, and the camera will shoot the participant unexpectedly. This actually was the most effective trigger to bring up the out-of-body illusion.

The function of the single-eye VR cardboard facilitated the feeling of being immersed in an unusual world. In fact, most of the participants reported some level of out-of-body illusion at the first few minutes until they realized they were tricked by the setting and they were just watching them being videotaped.

A qualitative analysis was done after the interview with the participants, and participants reported the effects are most significant when they see themselves from impossible angles (like from high upper to the ceiling or close up from the back) or unexpectedly. Participants who were physically strained reported a higher level of illusion as well.



Figure 3.2 Pilot study 1

Pilot Study 2

The second experiment is similar to the first one, I intended to trigger the out-of-body experience with a robot car I designed, I called this a self-detachment robot.

Firstly, I started using Arduino to build an obstacle-avoiding robot, and like the pilot study one, I put on a cellphone holder in the car with a FaceTime camera on. The users used Hacosco cardboard with a phone that is connected to the car, so they will see themselves from a third-person's perspective. The users will be asked to approach the robot car, however, the robot will escape when they approach. See Figure 2.1

The whole system let the user look at oneself in Realtime from a third person 's perspective as "another you", and at the same time kept escaping when you approach, so you will never catch it. The Hacosco cardboard again restricted the

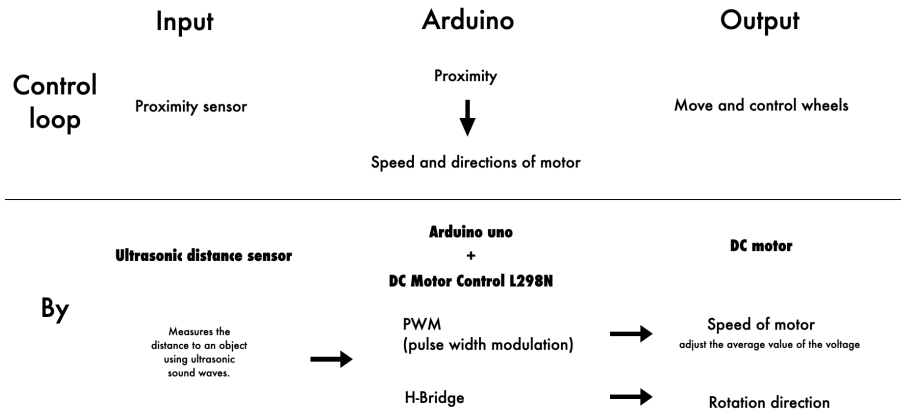


Figure 3.3 Pilot study 2, Arduino circuit 01

users' vision and increase the "immersive feeling" that VR sets can bring.

Users reported a moderate level of out-of-body illusion from this experiment.

Photogrammetry

I also tried using photogrammetry to build a 3d self-scan and use Unity to put the model in VR so people can put the headset on and look at the model in the virtual environment. However, a 3D scan of oneself without interactions is like a photo in a 3D version, although I was told it was fun, this design could not affect users in a cognitive way as I would like to.

From the above experience, we can find see yourself as a third person can trigger self-detachment, and unusual experience triggers the best results.

3.4. Positive Self Talk

The next interaction I wanted to design is positive self talk in VR.

What is Positive self-talk? Our inner dialogue, or "self-talk," shapes our beliefs and influences our emotions and behavior, as well as providing reassurance and motivation. Positive self-talk is a healthy way of coping.

What are the benefits?

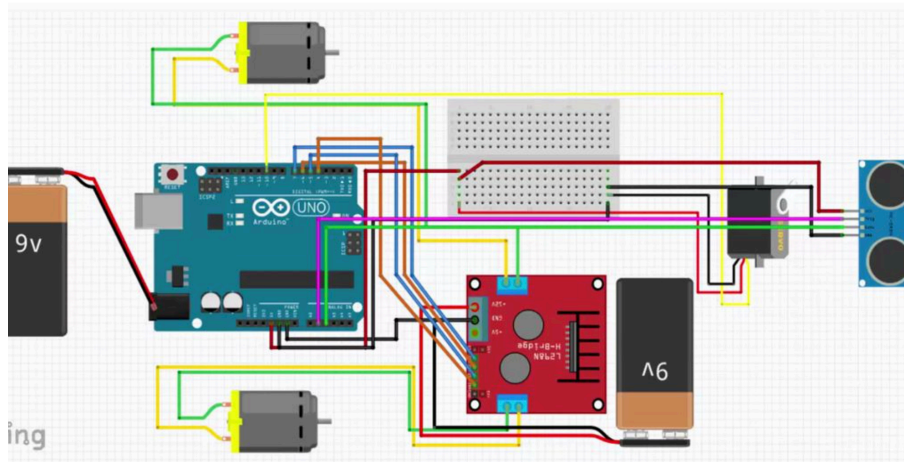


Figure 3.4 Pilot study 2, Arduino circuit 02

Studies have shown that positive self-talk can improve self-esteem, stress management, and well-being, reduce symptoms of depression, anxiety, and personality disorders, improve body image, and help people with eating disorders. can. Helps to motivate and calm self-harm and suicide, gain more control over one's life, relieve chronic pain, and overcome obstacles [46] [47].

Talking to yourself, so-called inner speech can be negative [48]. In order to avoid the negative effects caused by self-criticism, we should monitor our thought patterns, keep an eye on our stress levels and challenge our thoughts. And it's really important to refer to yourself in the 3rd person's perspective. And when bad things happen, ask what we can do Instead of why that happens.

In my proposal, I want my users to talk to their current selves as their ideal future self. The ideal self figure represents themselves in the future, so he/she can be trustworthy because there should be no secrets between the two. People will not feel shame or scared about talking to themselves. And the ideal future self has accomplished things that the current self wants to accomplish so this future self can lead to possible problem-solving training because we would assume he/she already has the answer.

Originally I wanted to replicate the Freud experiment and change Freud's avatar with the ideal self avatar [4]. However, that experiment used switch perspective

communication, and although it did the work, however, the process of talking, recording, perspective-changing, listening to the recording, and talking back, this loop can be bad for role-playing and bad for the narrative to develop. What I wanted to focus on is the narrative of the character, the experience of living as one's ideal self, a switch perspective may not be my best choice.

3.5. VRChat Platform

Several social platforms gathering users with VR headsets have been growing. Among these, VRChat is currently regarded as the most popular of these platforms. In VRChat, users are connected through a virtual hub and can visit a multitude of virtual rooms and socialize with other users present in the same room. Each user is represented by an avatar of their choice. In 2018, VRChat claimed to have 4 million total users, 30 percent of whom used a VR HMD. It currently has an average of 14900 daily active users. VRChat also has a special feature that draw my interest: it allows users to upload their own image to create their own customized avatar. VRChat also has a Mirror feature which functions like the mirror in the real world and allows the users to see themselves in reflection with the avatars they pick. Differs in the HMD, but VRChat also has different levels of motion capture functions, with quest 2, basic hand gestures, sit or stand position, and mouth movement can be detected.

3.6. Final Proposal

Eventually I purposed the narrative of "becoming your ideal future self". I want my users to do a role play in VRChat as their perfect ideal self and they are instructed to make use of the "worlds" available in the VRChat to finish one thing they would like to do if they become their ideal self. I believe the cognitive structuring process and reflection can happen while the person is immersed as the ideal self, and combined with a process of creating or overwriting self-conception with a positive meaning.

Chapter 4

Experiment Design

4.1. Method Overview

In our final design, we let our participant create the ideal self avatar, immersed to VRChat platform as the ideal future self, pick a “ world ” to complete a mission they would like to do as the ideal future self, and do a reflective talk with their current self (avatar generated ahead).

We designed two conditions of the ideal self in order to generate different level of psychological growth.

In the close-to-self condition (CTS), the ideal self was generated by the Custom VRChat Avatar Maker, a platform that allows you to upload a photo of yourself and generate an avatar based on your real face. See Figure 4.1.

In the away-from-self condition (AFS), the ideal self was picked from the whole avatar selection provided by VRChat, with any characters they want to pick as their ideal self. Participants were randomly assigned to groups. See Figure 4.1.

Through this experience, there are two hypotheses we would like to test on,

- * After the experiment, participants will rate higher on their self-awareness level and mood level;
- * The mood increase level, self-awareness increase level, and presence level will be higher in the CTS group than in the ATS group.

4.2. Materials

Questionnaires

The questionnaires included questions on personal information, such as gender, age, SAOQ, and the POMS (Profile of Mood State).

SAOQ = Self-Awareness Outcomes Questionnaire

The SAOQ is a 38-item self-report questionnaire with four components representing three beneficial outcomes (reflective self-development, acceptance, and proactivity) and one negative outcome (emotional cost). The SAOQ identifies the main impact of self-awareness: the positive changes we experience and the difficulties we may encounter as we get to know ourselves better. It is focused on the effects of self-awareness on people's daily lives and provides evidence of outcomes associated with practicing mindfulness and self-awareness skills in general. It can be used to identify ways to increase self-awareness that can enhance reflective self-development, acceptance, and proactivity while minimizing the associated emotional costs. [49];

POMS (Profile of Mood State)

POMS is a standard validated psychological test. The questionnaire contains 65 words/statements that describe the feelings people have. The test requires you to indicate for each word or statement how you have been feeling in the past week, including today. [50];

Alpha IVBO scale

Testing the effect of users' level of perceiving a virtual body as their own; [51];

4.3. Data analysis

All data were analyzed using SPSS software. Regarding SAOQ and POMS, the values of each variable in each condition were calculated by subtracting each value obtained in each condition from the baseline in order to analyze the effect of each condition on these measures. Therefore, the dependent variables of self-awareness and mood were transformed to the changes in each rating from the baseline state. The values for the other measure Alpha IVBO were directly compared in terms of the two conditions of avatar grouping.

4.4. Experiment

4.4.1 Participants

Twenty-four participants (mean age = 23.1, SD = 3.6, 12 females) were recruited for the experiment.

4.4.2 Equipment

2 head-mounted displays (HMD; Oculus Quest 2, Oculus VR, California)

4.4.3 Procedures

The Procedure of the study was the following:

- * Participants got the explanation about the experiment first and sign the ethical consent forms before they start the experiment.
- * Participants completed the mood and self-compassion questionnaire. Then they would be told to write a short description on a paper about what their ideal future self would be like, physically and mentally.
- * Participants were randomly assigned to the CTS group or the AFS group. Both groups need to generate a self-like VRChat avatar using the VRChat avatar creator with little to no decorations added to the appearance. Example See Figure 4.2.
- * Participants in the CTS group were told to generate another self-avatar using VRChat avatar creator. They then were asked to modify the avatar into the ideal future self using the features available from the app. After the formation of the ideal future self avatar, they were asked to put on the HMD, immersed in VRChat, and picked the ideal self avatar to play. Example See Figure 4.2.
- * Participants in the AFS group were told to put on the HMD and enter VRChat, after they had immersed in VRChat, they would pick an avatar available from the default as their ideal future self.

- * Participants from both groups were asked to step in front of the Mirror and do some movement with their avatar body, observe the reflection in the mirror and observe the synchronous of their body and the avatar. See Figure 4.1.
- * Participants were asked to step into the world they pick, and complete a mission they would like to do as the ideal future self. This session should be done in 30 minutes. See Figure 4.3.
- * After they complete their task they were asked to enter any empty world. An experimenter would immerse in the same world wearing the current self avatar created ahead. The ideal self avatar should observe the current self avatar from the third person 's perspective and start to talk. See Figure 4.4.
- * This talk should be a reflection of this experience and what they want to say to their current self including 3 things they are doing just fine that they should continue doing so that eventually, they will achieve their goal and become their ideal self.
- * Participants were asked to finish VRChat and put down the HMD.
- * Participants were asked to fill SAOQ and POMS scales again and the Alpha IVBO scale testing presence level.
- * Participants would be interviewed by a psychologist for reflections.



Figure 4.1 Examples of ideal self avatar choice for CTS group (top) and AFS group (bottom) in front of the mirror.



Figure 4.2 Examples of the current self avatar and the ideal self avatar being created.



Figure 4.3 An example of the user enjoying living as the ideal future self in one of the worlds



Figure 4.4 Ideal self talk to current self from 1st person perspective

Chapter 5

Evaluation

5.1. Analysis of the SAOQ (self-awareness)

The change in the self-awareness from the baseline for each condition indicates that the choice of avatar group presents a significant main effect, $F(22, 15) = 5.241$, $p < .05$. Participants reported stronger self-awareness level in the CTS condition than in the AFS condition. The self-awareness level significantly raised after the experiment, $p < .05$. See Figure 5.1.

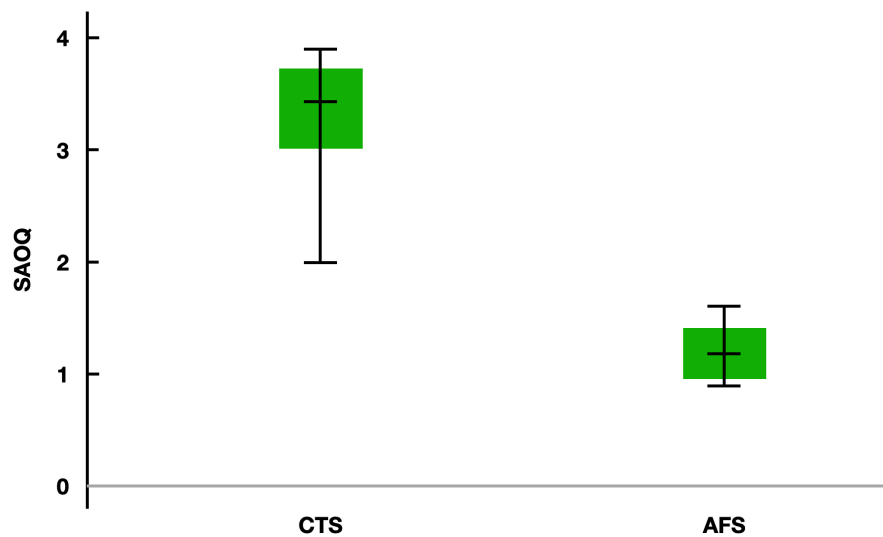


Figure 5.1 SAOQ

5.2. Analysis of the POMS (mood)

The change in the mood from the baseline for each condition indicates that the choice of avatar group presents a significant main effect, $F(22, 16) = 4.457$, $p < .05$. Participants reported better mood in the CTS condition than in the AFS condition. The mood score significantly decreased (score decreased indicates an improvement in the mood) after the experiment, $p < .01$. See Figure 5.2.

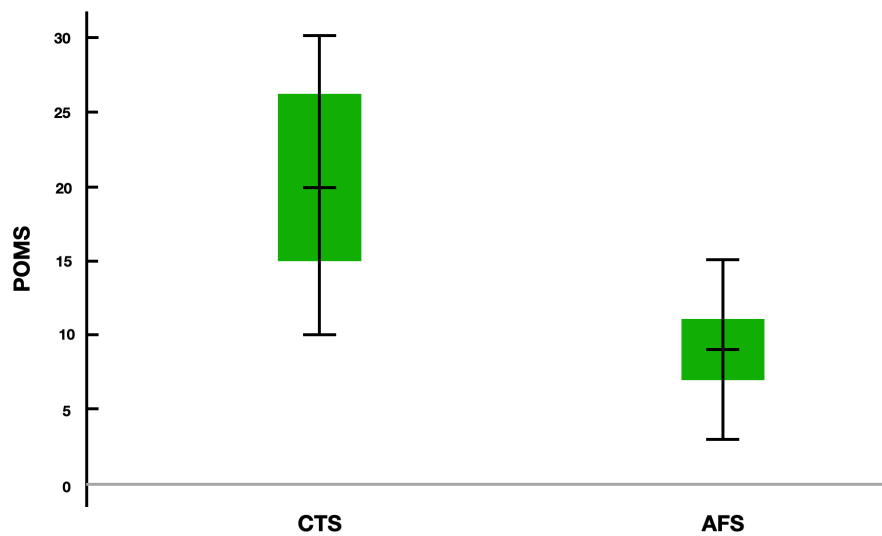


Figure 5.2 POMS

5.3. Analysis of Presence

Participants did not experience a significantly stronger presence in the CTS condition than in the AFS condition, $p > .320$. See Figure 5.3.

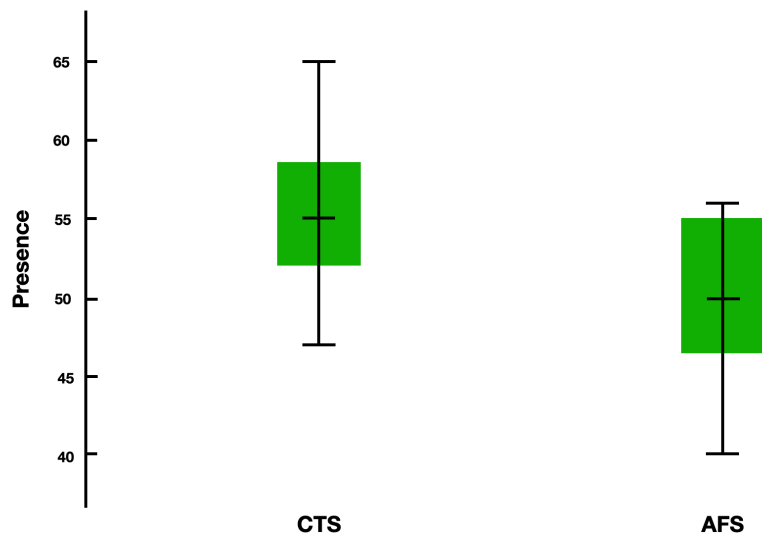


Figure 5.3 Presence

5.4. Qualitative Analysis

With the afterward interview records, I did a qualitative analysis to determine how this “becoming ideal self” experience was perceived and described by the participants. This analysis will focus on the change in narrative identity, and whether a virtual environment with an avatar feature provides an opportunity for individuals to externalize negative factors and experience alternative self-narratives that influence real-life identity.

The following sections provide examples and explanations that help best capture the core themes that emerged from the participant interviews.

5.4.1 General Impressions to the Experiment

On a general level, participants tended to value the way the experiment was designed. A typical example like a 24 age female master’s student, who rarely plays any digital games, nor had any VR experiences before, and was impressed by the immersion that VR brings at first. And she described her experience as

”the whole journey is a miracle” As a law student, she chose the courtroom in VRChat and used the time to give a verdict like a real judge. She reported feeling a closer connection toward the ideal self and her career goal.

Another participant, who has been struggling with weight loss, was able to use the avatar to give herself a more concrete image of how she would look if she succeeded in weight loss. When she was immersed in VRChat, she wanted to have as many social interactions and communication as possible with others in the ideal self figure, so she picked a popular bar and she reported having a great time and gained more motives and confidence in weight loss.

”I ’ ve always wanna be a singer” another participant reported, her singing experience in the VRChat world made her happy.” ”I had a feeling of time slipped to the future. And through this experience, that future seemed not unrealistic but more relatable and reachable.”

unanticipated cases

However, we also encountered several other cases where the goals of the participants were more serious, often focusing on overcoming difficult physical or emotional situations, such as battling long-term mental illness.

One participant, who has been struggling with a bad relationship, tried to go to a party in VRChat alone and had some great conversations over there. “ It ’ s such a relief to find out the situation is not all that bad even if you got a divorce. There are still things you can enjoy and look forward to. ”

A nonbinary participant created a genderless-looking avatar using their own photos, which allowed them to feel the reassurance of what appearance they really want to be seen.

The other participant, a 26 male VR user who suffered from OCD before, said in the interview “ I find it quite peaceful to act as I have recovered. And since there are no real physical interactions in the virtual world, my anxiety level decreased a lot. I got into OCD when I was 24, and when I tried to talk back to my current self, I felt totally sorry for him, but at the same time, I want him to know that everything will be fine, and even bad things happened, we could still find a way out. ”

A VRChat heavy user, a male 19-year-old college student, gave feedback and

reflection with some distinctive perspectives, he has been a gamer and VR user for 5 years. He said "The way I portray myself, the character I chose when I play games, is the way I want to be seen, which is always 'the ideal self' no matter how different that character and me look. When I had a frustrating day, I always went to the game world and had a few battles, which let me feel the 'control' over life that I did not gain in the real life" When describing the difference between her regular game experience and this ideal self-journey, he said: "The narrative definitely gave a more concrete referencing, and to be frank I had a wired feeling. But eventually, I could indeed feel a closer connection with my ideal future self." From his confession, we can find his virtual identity and real-life identity mean almost the same to him.

The examples above highlight how our design had given the participant a unique and thoughtful way to use VRChat as a resource to shape their narrative identity; from simply boosting the mood to building a continuous supportive self-narrative.

Chapter 6

Discussion

6.1. Conclusion

In general, participants reported positive feedback after the experiment. They reported the experience was new to them, and it has some magical power and they felt excited while doing participation. of the participants reported improvement in mood and self-awareness levels afterward. For people in the CTS group, who are using the ideal self figure that is close to their original self, they had rated the experience more positively than people in the AFS group, which proved our hypothesis. An immersion with an ideal self avatar closer to the original self helped them get a more concrete image of that ideal self figure. Seeing oneself from a third-person perspective triggered more objective feelings toward the original self.

For presence level. Both groups reported a high level of presence in our experiment, and there is no difference between different conditional groups. In addition to the immersion feeling that the VRChat platform itself brings, I would argue that most of our participants are using VR for the first time, the sense of novelty could also facilitate their presence level.

6.1.1 Limitations

There are also some limitations to this design. One of them is motion sickness, which happened while there's usually no actual "motion" in a VR travel experience, the brain is "tricked" into thinking it's moving due to visual input from the eyes, but the body and inner ear remain still, this disconnect can lead to VR motion sickness in some people. Since most of my participants were using VR for the first time, many of them experienced some level of motion sickness. The second limitation related to the narrative itself, it's quite a big challenge for

socially phobic people to actively participate in our experiment since in the VR-Chat platform, people would encounter a lot of strangers when they were doing the procedure.

The third limitation is the headset can be heavy for my participants. We were using the Quest 2 and I got some feedback that it can be kind of hard for people to put the headset on for more than 30 minutes. Another limitation is the talk to current self-interaction was not really a conversation since only the future self was talking. However, it can be quite difficult to change that experience due to technical difficulties.

6.2. Future Works

Normally, psychological interventions happen in real therapy rooms. However, in the post-Covid era, moving offline interventions to online VR platforms can be an alternative solution.

Lots of psychological interventions work better with a longitudinal practice. So for people who find this experiment beneficial, it would be interesting to give them the session once a month and to observe what changes can happen over a certain period of time compared to a one-time intervention. It would also be interesting to observe what would happen to the level of improvement after the time and experience cumulated.

Secondly, for the current experiment, most of our participants are recruited from university students, however, for people at an average age of 20, the image of the ideal future self may not be so unfamiliar compared to people who are in elementary school. I believe it would be really interesting to use test this experiment with younger people like little children and find out what will happen afterward for younger generations.

I am also very interested in the relationship between out-of-body experience and meditation. Since detachment was one of the core values in meditation practice. Maybe it would be nice if we could test how the out-of-body illusion induced detachment can facilitate meditation practice, and how does self-detachment and mindfulness state relate.

To summarize, in this study, we tested the possibility of using an existing online

platform VRChat for a quick “self-searching” process. we demonstrated an example of how social virtual reality can be applied not only for entertaining but also for our identity formation and growth. We proposed a stable and more accessible psychological practice with a relatively low-cost compared to traditional ones. It can be a great tool for mood intervention and gaining self-awareness even if you are just alone by yourself in this pandemic.

This experience may not be a complete cure solution for mental diseases, however, improving mood, gaining better self-regulation skills, and having more objective and compassionate cognition toward yourself can be a good start for people to change their habituated ways of judging themselves harshly and fall into the self-criticizing circle.

6.3. Discussion

6.3.1 VR can be A Two-Edged Sword

Using VR has a dark side. Studies show that virtual reality can induce symptoms of DPDR (Depersonalization and Derealization). This disorder is characterized by chronic sensations or unreality. In depersonalization, the individual experiences the unreality of the physical self, and in derealization the individual experiences the unreality of the external world. For example, people with this disorder report feeling like they have lost their sense of agency, and as if they were living in a dream. We should take this into account while developing the technology.

The Problem of Screen Time

Since our bodies spontaneously respond to virtual environments and the avatars we embodied, according to Madalie Metzinger, “long-term immersion could cause damage to the neural mechanisms that create the feeling of reality, of being in immediate contact with the world and one’s own body” and “heavy users of VR may begin to experience the real world and their real bodies as unreal, effectively shifting their sense of reality exclusively to the virtual environment”. There are powerful drugs that cause hallucinations and auditory hallucinations, alter subjective perceptions of time and identity, and further influence the relationship

between oneself and the world. VR can do the same if we're not careful. Regardless of what our avatars look like, we all need to stay true to our inner selves.

6.3.2 VR and Privacy Issue

In the current social VR platforms, it can be hard to protect your avatar. Now we know VR has a great influence on identity build, when we look at the loose and open nature of the network itself, some privacy issues may occur.

Social VR provides a digital space for a variety of human activities, social interactions, and concrete face-to-face encounters. Our digital bodies in social VR can often have just about any appearance imaginable, and personalized avatars that resemble the users have recently become a topic of research. As our experiment showed, such digital bodies show great potential to enhance the realism of social VR citizens and increase the believability of human interactions. However, using such digital entities can expose users to privacy and identity issues, like identity theft. Questions such as how can we know if the avatars we encounter in the virtual world are who they claim to be should be considered.

Protecting user identities and privacy, and preventing damage from identity breaches are critical to the future of social VR.

6.3.3 Positive Usage of VR

Thieme et al suggest that "the field of human-computer interaction needs to increase its effort to include strategies that can positively contribute to people's mental well-being in both the design and evaluation of future technology." We must take responsibility and we should participate in shaping that positive future.

To be able to achieve this in a healthy way, we need to do more research on the impact of VR usage and how we can design positive user-environment interactions. I am very happy that my design can be one of the positive interaction designs in VR field. Not only should we have a positive relationship with VR, but we should also have a healthier relationship with the physical world.

Further research will be crucial.

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Appendices

A. The Self-Awareness Outcomes Questionnaire

Below is a list of statements about your general experiences. Using the scale, please indicate how frequently you experience or engage in each of them by choosing your answer from *Never*, *Rarely*, *Occasionally*, *Frequently*, *Almost always*, and *N/A*.

There is no “right” or “wrong” answer as everyone is different, so simply answer according to your own experience. (If you are not currently working, you may find a few questions are not applicable to you. In this case, please choose the N/A response.)

1. I learn about myself and how I see the world.
2. I understand my emotions.
3. I am content with my work situation.
4. I find it scary to try something new or step out of what I know.
5. I focus on ways of amending my behaviour that would be useful.
6. I have fun.
7. I recognise the stress and worry in my current work.
8. I feel vulnerable.
9. I reassess my own and others' responsibilities.
10. I have compassion and acceptance for others.
11. I see my work life as something I have power to affect.

12. I feel my emotions deeply.
13. I'm aware of my abilities and limitations.
14. I am objective.
15. I understand how I work within a team.
16. I have had to revisit difficult past experiences.
17. I "observe" myself.
18. I understand myself well.
19. I can "take a step back" from situations to understand them better.
20. I feel exposed.
21. I feel generally positive about self-awareness.
22. I am consistent in different situations or with different people.
23. I think about how my personality fits with my work role.
24. I find making changes is difficult and scary.
25. I have insight into myself.
26. I stop and think before judging.
27. I have changed the way I work.
28. I feel guilty for criticising others.
29. I look at why people act the way they do.
30. I am confident.
31. I take control of my work.
32. I am continuing to work on and develop myself.
33. I interact well with colleagues or peers.

- 34. I think about how as colleagues or peers we interact with each other.
- 35. I am realistic about myself.
- 36. I feel on the whole very comfortable with the way I am.
- 37. I am reflective.
- 38. I have a good self-image.