

# ***Study Evaluating the Availability of Virtual Reality Applications for the Treatment of Eating Disorders***

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**Abstract:** Eating disorders are serious mental illnesses characterized by abnormal eating behaviors and attitudes. The prevalence of eating disorders among high-income young women in Asia has increased dramatically since the late 20th century. Results of treatments such as medication, clinical therapy, psychotherapy, etc. are often unsatisfactory. Virtual reality has been used in eating disorders, both by changing the size of the body image and by creating a virtual environment. The purpose of this study was to design a Virtual reality application for the treatment of eating disorders and to explore its usability and feasibility. A virtual reality-based application was designed to help treat eating disorders. This application can solve the comparison and low self-esteem problems that arise in other treatments by choosing individual therapy or group therapy after selecting a virtual avatar. Participants are then recruited to experience through questionnaires, thus obtaining user feedback. A total of 9 female participants were recruited, including 2 AN and 3 BN, and 4 BED personnel. Seven participants preferred individual therapy and 2 participants preferred group therapy. According to the data analysis, BN and BED patients were more likely to have group therapy and twice-weekly therapy frequency. Patients with AN tend to prefer individual therapy and more frequently weekly therapy. Participants felt that VR therapy was more private and felt more secure. According to participant feedback, apps need to pay more attention to protecting patient privacy and how treatment data is collected. Participants found the application available. Future research should aim to assess similarities and differences in the availability of group therapy as well as individual therapy. To investigate which specific eating disorder behaviors are effective in group therapy as well as individual therapy.

**Keywords:** Eating disorders, individual therapy, eating behaviors and attitudes.

## **1 Introduction**

### **1.1 Information about the Eating Disorder**

Eating disorders are eating disorders characterized by abnormal eating behaviors and attitudes, including three specific eating disorders: anorexia nervosa, bulimia nervosa, and binge eating disorder. Anorexia nervosa is characterized by an inability to maintain a healthy weight, and a series of measures (dieting, excessive exercise, fasting, etc.) are used to lose weight. Bulimia nervosa is repeated overeating and inappropriate compensatory behavior (emesis, overuse, drug use, etc.). The

difference between binge eating disorder and bulimia nervosa is that binge eating disorder does not take compensatory actions [1]. Asia is the most populous region in the world and where eating disorder is very prevalent, the incidence of eating disorder is increasing [2]. Since the late 20th century, the proportion of high-income young women in Asia with eating disorders has increased dramatically [3].

The main causes of eating disorders include sociocultural factors, family factors, negative influences, low self-esteem, and body dissatisfaction. At the same time, personality variables such as biological factors, genetic predispositions, perfectionism, separation, maturation fears, and interpersonal mistrust appear to contribute to the development of the eating disorder. In the current sociocultural context, media and peer pressure have a much greater impact on women than on men. At the same time, this gender-related stature assessment is often used to explain the much higher prevalence of ED in women than in men [4]. Negative family influences are responsible for the development of ED, including family communication, parental care, etc. As a result of the transformation of society and economic developments, including the development of the global fashion and beauty industry and the influence of the media, has had a transformative impact on women's lives [3]. According to sociocultural models, information about weight and appearance is communicated to members of society through the media, peers, and family. Body image disorders and eating disorders can easily develop due to social pressure and the dissemination of media information [5].

The negative effects of eating disorders are enormous. The average prevalence of anorexia nervosa in young women was 0.3%. The prevalence of bulimia nervosa is 1%. The prevalence of binge eating disorders is at least 1% [6]. In an 11-year study, the overall mortality rate for anorexia nervosa was 5.6%, and half of the deaths were caused by suicide. People with anorexia nervosa also have associated medical problems and cognitive impairment. Bulimia nervosa has a relatively low mortality rate but can cause cardiovascular disease as well as dental problems. At the same time, there will be substance abuse or dependence and personality disorders, which will affect the quality of life. Morbidity and mortality are higher in binge eating disorder than in bulimia nervosa and increase with weight [7]. For the treatment of eating disorders. There are few studies on the use of drugs to treat anorexia nervosa, but CBT can reduce the chance of relapse. Fluoxetine can be effective in the treatment of BN in the short term. At the same time, individual or group CBT is effective in the treatment of bulimia nervosa. Individual or group CBT is also effective for the treatment of binge eating disorders [1].

## 1.2 Current Developments in Virtual Reality

Virtual Reality (VR) is a technology that generates a simulated experience in which users feel and accept it as a real environment, with multiple features of 3D graphics, images, or 360-degree videos on computers or mobile apps on smartphones. By wearing the virtual reality headsets or standing in multi-projected environments that provide realistic images and different sensations, users can experience a virtual environment that is similar to or different from real life [8]. Through Haptic technology, users can move around and interact with different features, including auditory and video feedback, using a combination of vibrations and motions [9]. As a new take-off industry, Virtual Reality is commonly used in entertainment applications and has also been applied to medicine, culture, education, and architecture as an effective tool. In medicine and psychology, VR provides cost-effective training to trainees allowing trials and altering their errors. (Westwood, J.D) Virtual Reality is also a therapeutic intervention to study and replicate interactions in a controlled environment; examples include exposure therapy for treating anxiety (VRET) (Groom, Victoria, 2009). In terms of eating disorders, Virtual Reality offers some advantages and possibilities that common ED treatment or CBT treatment does not have. While therapists worry that exposure therapy might harm patients

and intrigue anxiety disorders, recent studies suggest that VR-based exposure therapy is more applicable and practical for eating disorders. Exposure can be customized and help patients cope with complex experiences in a more controllable way. In addition, since virtual exposure is safer and more stable, patients may progress more rapidly in VR therapy [10].

## **2 Literature Review**

### **2.1 Current Status of VR Therapy for Eating Disorders**

In the current state of eating disorder treatment, virtual reality has developed other therapy options which can be explored in two main aspects: body dissatisfaction and virtual food stimuli. For the first phase, therapists present patients' bodies with a three-dimensional image. The virtual image helps patients understand a more realistic view of the body by giving possibilities to face and modify distortions and potentially decrease body dissatisfaction [11]. In the second treatment, therapists stimulated a virtual environment of different scenarios where patients are exposed to emotionally provoking eating-related situations. By gradually increasing the exposure, patients can practice their eating/emotional/general decision-making skills [11]. Limitations of current VR development include costly devices, motion sickness, and safety concerns. VR headsets are generally heavy and expensive, ranging between \$ 300 and \$800, and not all medical institutions or patients can afford them. Due to frequent head rotations and heavyweight, the user might feel sweating, dizziness, headaches, and even nausea[12]. Moreover, the virtual environment could cause problems in the cognitive and real-life experiences, leading to safety concerns for eating disorder patients in distinguishing between themselves and the virtual world [13].

### **2.2 Problem Statement**

Eating disorder patients face the problem of comparison and self-esteem in the current ED treatment. In supporting bulimic individuals and binge eaters, group therapy has been an excellent approach by providing support and acceptance to each other and learning interpersonal skills and friendship. However, recent studies pointed out that group therapy has not been effective and successful when applied to all the eating disorder patients. Unlike bulimia, recent studies show that anorexics patients are usually highly competitive and comparative. They can easily compare themselves to being the thinnest group therapy members [9]. Moreover, research showed that it is joint for eating disorder patients to have a social anxiety disorder [14]. This anxiety includes eating in front of others or having concerns about how others perceive their body image. Therefore, walking into a medical center and talking to a therapist is stressful and challenging for eating disorder patients with low self-esteem [15].

We plan to solve these two problems through VR technology and virtual avatars. The virtual avatar is a graphical representation of a user and user's characteristics. By letting the patient choose what they want to look like in a virtual environment, they are more comfortable speaking about their experience and participating without worrying about showing their actual self in real space [16]. The VR platform creates a more private and safer environment for all the eating disorder patients and their self-esteem. Furthermore, using VR-based group therapy sessions that generate avatars, patients do not need to worry about their looks, and there is no more comparison. Instead, they would focus on group treatment and progress together with other patients.

## 2.3 Objective

The purpose of this study was to design a Virtual reality application for the treatment of eating disorders and to explore its usability and feasibility. The application is based on Virtual reality principles and is designed to be used in the treatment of eating disorders.

## 3 Method

The design of the application is mainly divided into two parts. The first step is to choose your avatar. The second step is to choose individual treatment or group therapy according to the needs.

Step 1: Choose Avatar

Step 2: Choose the treatment method – individually or in groups

### 3.1 Individual Therapy Progress

- In the individual CBT (cognitive behavioral therapy) program, the user will enter a cozy virtual room where they can sit down and talk to the virtual avatars of the therapist.

- In stage 1, the therapist would help the patient to identify their thought patterns and beliefs related to the eating disorder, including food, weight, body shape, and appearance.

- After addressing the problems in stage 2, the therapist would devise a plan based on the result and hold weekly sessions. It involves cognizing body image, dietary restraint, and personalized eating plans & events.

- Towards the end of stage 3, therapists focus on future setbacks and maintaining the changes. After treatment has ended, there will be a few review sessions that monitor the patient's progress. Based on research on average CBT time, there would be approximately 20 sessions of 1 hour in 20 weeks.

- The whole secession is Virtual Reality and Avatar based, which means therapists and patients would not be able to see each other in the real world. Instead, by meeting virtually, virtual avatars give them a comfortable space to talk and relax with great privacy. In addition, it satisfies the patient's self-esteem and lets the therapist monitor the patient's responses more controllably.

### 3.2 Group Therapy Progress

- Select the virtual scene (restaurant, beach, mall, swimming pool, beach, stadium). These scenarios are key conditions presented about maintenance/relapse mechanisms and areas of body image comparison. Exposure to social situations is associated with body image and being taught to face them adaptively.

- Restaurant: There is a virtual food area. You can eat with your peers, expose your reactions to virtual foods, and discuss subjective and desired differences in food and weight. Address the problem of negative emotions that arise after eating. Using a virtual avatar provides a sense of security and privacy.

- Beach, swimming pool, gym: better solution to the problem of body image. Patients can compare subjective and desired differences in body shape. At the same time, you can use avatars to show that you are trying to use the real body completely, exposing your dissatisfaction with the body.

- Shopping malls, supermarkets: stimuli that trigger abnormal eating behavior can be assessed. The use of avatars does not need to care about the opinions of others, patients will choose food based on their own subjective so that they can better expose their problems repeatedly, so they can better face and solve them.

## 4 Experiment

### 4.1 Participant

Eating disorders in young Asian women. Invite individuals to participate in research via email and personal invitations.

### 4.2 Procedure

Use questionnaires to set up relevant questions to get user feedback. Each participant attended an information session that introduced the subject of the questionnaire and related considerations. They were informed of the study and encouraged to ask questions, and then if they agreed to participate, they signed a written consent form.

### 4.3 Outcome

Participant Information: A total of 9 female participants were recruited, including 2 AN and 3 BN, and 4 BED personnel. Their average age range is 18-25 years.

7 participants preferred individual treatment and 2 participants preferred group therapy. For participants who opted for individual treatment, the average proportion of people who felt safe using avatars was 60%. For participants who opted for group therapy, it was agreed that the three types of virtual environments set up by the app would meet their daily training needs, one tending to train in a restaurant and the other in a mall. Participants believed that the average similarity of emotional responses generated in a virtual environment to those produced in real life was 91.5 points. According to data analysis, BN and BED patients are more likely to be treated in groups and twice a week with a frequency of treatment. Patients with AN tend to treat individually and prefer a weekly frequency of treatment. Patients perceive more privacy and security in terms of the benefits that VR treatment can bring to patients compared to other treatment methods, safer than going to the hospital for treatment and being able to describe their feelings and experiences in a very comfortable and natural state, as well as facilitating patients who are inconvenient to go to the hospital for treatment. Regarding the recommendations section given to this app, based on participant feedback, more attention needs to be paid to the protection of patient privacy and how treatment data is collected. 5 participants felt that additional technical guidance and assistance were not required, and 4 participants felt that guidance outside the provider was needed.

## 5 Discussion

The questionnaire survey mainly focused on eating disorder patients' experiences and feedback on the VR platform. Based on the survey result, virtual avatars generally create a safe and private place for users to speak, with a safety index of 60%. Moreover, the group session perfectly simulated real word experience with a similarity of 91.5 % and comfortable scenarios that resonated with participants. However, we noticed that only 22% of the participants chose the group session. The result is that group sessions are not a standard therapy option, and many participants are not familiar with the information. In addition, some participants are worried about their data privacy because VR systems can collect personal & biometric information. Based on this feedback, we will make sure data needs to be regularly purged. At the same time, before the therapy, mention that the institution's data and privacy responsibilities will not be used for other purposes. We planned to provide extra help for individual and group sessions after the weekly sessions because 44% of the participants thought they needed extra help. For individual sessions, patients would need to update the progress on their personalized eating plans, and therapists are free for any questions online during or after the therapy.

This research summarized the problem based on the past research papers and experiments on Eating disorders. The problem in the current state of VR development is that ED patients face comparison and self-esteem issues during treatment. Entrenching in the problem statement, our group used Virtual Reality Technology to create a 3D dimensional VR platform that allowed individual & group sessions with virtual avatars. After the idea had been generated, a questionnaire was created for feedback from ED patients.

The limitations of this study lie in the following aspects. The first problem is that the application is not developed, so prototype testing cannot be done, and user feedback in the form of questionnaires may lead to insufficient accuracy. The second potential problem is that the sample size of the questionnaire is insufficient, so the feedback obtained is not representative of the overall audience and may also affect the results of the questionnaire. The third problem is that most of the participants have no experience with VR technology, so they may not be able to answer the questions of the questionnaire accurately.

Future research should start from the following aspects. Should aim to assess similarities and differences in the availability of group therapy as well as individual therapy. To investigate which specific eating disorder behaviors are effective in group therapy as well as individual therapy. To ensure the accuracy of experimental results, a prototype of the application should be developed, and then a sufficient sample of participants should be recruited to test the prototype to get feedback. At the same time, since VR technology is still immature in the treatment of ED, various factors that affect usability, such as sense (vision, hearing, touch, taste, and smell), should be evaluated.

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