

# Research on the Application of Computer-based Psychotherapy in Clinical Guidance

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**Abstract.** Based on the B/S architecture combined with MVC programming ideas, this paper uses Python language to design and implement a computer psychotherapy system. Numerous experimental results show that its effect is not significantly different from traditional therapies, and it has broad prospects for development.

**Key words:** Computerized psychological diagnosis and treatment, clinical application, psychological consultation System.

## 1. Introduction

Traditional mental health assessments, especially large-scale mental health assessments, mostly use questionnaire survey methods based on self-rating scales. This method is not timely, and the current mental state of the subject who fills in the self-rating scale is greatly affected, and its intrusive characteristics will also cause the subject's resistance and increase the false alarm rate.

With the continuous improvement of computer hardware performance and the continuous updating of software, the application of virtual reality technology in the field of entertainment games has achieved considerable results, but in addition to its important role in the field of games, it can be the application of virtual reality to the education industry, medical care field, etc. realizes its true value. Use the three-dimensional virtual environment to break through the original human cognition of the two-dimensional world with the Internet as the link, and even provide users with a four-dimensional experience to reconstruct their lives, and use more objective and effective means to target education psychology and medical care psychology [1]. More objective evaluation tests, etc. The psychological catharsis function can be implemented for different users in different situations, to avoid unpredictable harm caused by people in the real society due to their own psychological impulses making unexpected actions on surrounding objects or lives.

## 2. Classification of mental illness

### 2.1. Depression

Depression is a group of mood disorders or affective disorders with depression as the main symptom caused by various reasons. It is a group of clinical symptoms or states centered on self-experience of depression. Some scholars use computer technology to allow depression patients to express sympathy and comfort to themselves, and carry out "compassion-focused therapy." The 15 patients whose treatment of major depression reached a stable level entered the first stage of the scene, and the patient delivered a sympathy expression to a little girl according to the instructions provided. In the second stage, the patient is transformed into the body of a virtual little girl, and the patient re-experiences their previous expressions of sympathy from the little girl's new perspective [2]. This virtual reality is repeated twice, with an interval of about 1 week. The results of the test showed that the patients significantly reduced their sense of self-blame and guilt, and at the same time increased self-compassion, and the severity of depression was significantly reduced. Although the effect of sympathy-focused therapy has been fully proven, many psychological treatments related to self-criticism and self-compassion require a wealth of imagination. For many people, they are quite difficult to operate in practice. Because it is often difficult for people to control their imagination, to

enter imaginary situations, or to maintain their imagination for a long time. And immersive computer technology can just help people solve this difficulty.

## **2.2. Trauma and stress related disorders (PTSD)**

Some scholars virtualized Iraq and Afghanistan war treatment scenes. After the war, PTSD patients can feel gunshots, explosions, insurgent attacks, etc., the touch of holding a gun, and environmental smell. These are based on the therapist's experience when the patient was traumatized. The scene is controlled and adjusted in real time to match the description of the patient experience. For the overall progress of treatment, the therapist will tailor the patient's previous experience to let the patient know how to adjust and control anxiety, get "habituated" for past traumatic experience, and emotional processing of traumatic experience is necessary [3]. It is also effective for non-war related PTSD. Computer technology scenarios can effectively bypass the active avoidance of PTSD and help patients face and deal with this experience. As a tool of exposure therapy, the therapist can accurately control the emotional intensity of the scene, determine the degree and speed of exposure, etc., and can record objective exposure stimuli and patient response results. Traditional imaginary exposure therapy cannot do this. At the same time, the ease of reproduction and availability of computer technology exposure therapy is also obvious. The World Trade Centre has disappeared, and it is not safe to return to the battlefield in Iraq. Computer technology can make up for these shortcomings of reality exposure.

## **2.3. Schizophrenia spectrum and other psychotic disorders**

Some scholars have used computer technology to simulate reality to treat the symptoms of persecuted delusions, and have achieved remarkable results. The research includes patients with schizophrenia, schizophrenia, delusional disorders, and other psychotic disorders. Two scenarios were set up in the experiment: subway cars and elevators, each of which was divided into several intensity levels. The treatment group (virtual reality cognitive therapy) received instructions in virtual reality to reduce safety-seeking behaviours, while the control group (realistic exposure therapy) remained unchanged. Evaluation methods include the Positive Symptom Scale of the Positive and Negative Syndrome Scale (PANSS), the delusional part of the Mental Symptom Rating Scale, the victimized belief part of the safety behaviour questionnaire, and the Beck Anxiety and Depression Self-Rating Scale. After the test, the delusion level dropped from 79.8% to 46.5% in the treatment group; from 78.5% to 67.6% in the control group [4]. After training, when patients in the treatment group entered a real-world situation (such as going to a supermarket to shop), their pain level was 19.6% lower than that in the control group. Let the patient make direct eye contact with the characters in the virtual scene, and let them find that the situation they are afraid of is very safe, and nothing bad happens, so that the thought of being threatened disappears, can help them build self-confidence and encourage the patient's social contact. Computer technology ET is of great significance for the cognitive behavioural treatment of delusions. It has new research perspectives for the occurrence and maintenance of delusions, such as reasoning bias, negative self-belief, excessive worry, and fear, etc.

## **3. Computer psychotherapy**

Psychotherapy is a systematic continuous process, which mainly includes four stages: problem exploration, analysis and understanding, treatment action and consolidating. In the first stage, the psychologist communicates with the sick patient through conversations, questionnaires, etc., pay attention to the way and content when talking, so that the patient can relax emotionally, to obtain effective information from the patient [5]. The key to effective treatment; the second stage, based on the patient information obtained in the previous stage, the cause diagnosis is performed, thereby determining the treatment goal, and the appropriate virtual reality treatment plan is formulated according to the patient's specific situation; the third stage, the implementation of the treatment, and the psychological Experts observe the condition of sick patients and give specific guidance; in the fourth stage, further training, consolidation and other suggestions are given to patients who are

recovering, and they are encouraged to use the coping skills they have learned to deal with various problems, and at the same time Patients who have recovered are required to report their experience and experience to a psychologist to consolidate the curative effect. As patients may have new psychological problems during treatment, in the latter three stages, psychologists should adjust treatment strategies in time according to the effects and conditions of treatment. The specific psychotherapy process model is shown in Figure 1.

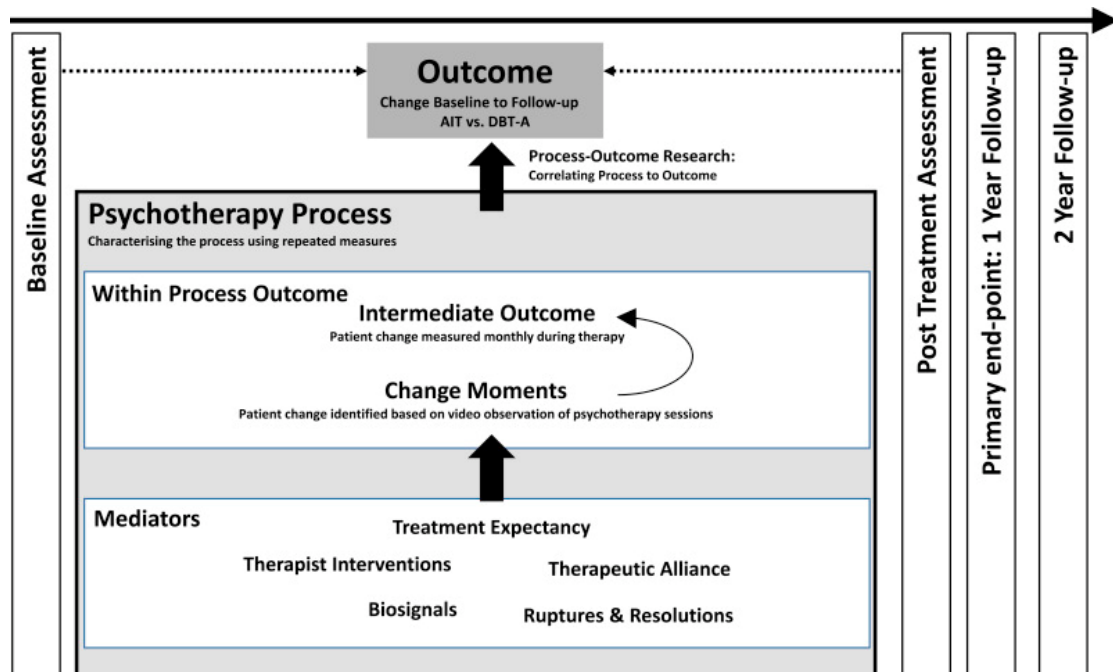


Figure 1. Psychotherapy process model

#### 4. Design of virtual reality psychotherapy system

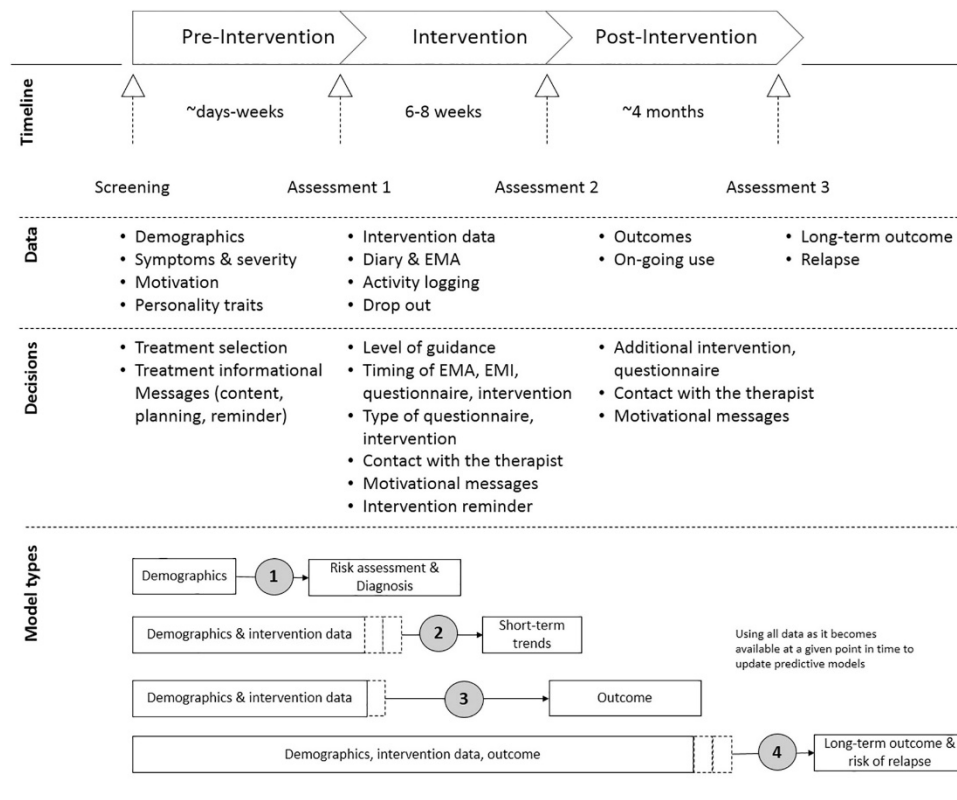
##### 4.1. How OpenGL works

OpenGL is currently the most widely used and easy-to-use cross-platform graphics function library. OpenGL is only a graphics function library, not a programming language, so it can only play a role in combination with other programming languages. The OpenGL instruction model is C/S, usually the user program issues commands, submits them to the kernel program, and the kernel program executes various instructions. VC++ is a visual programming application widely used in the Windows operating system. VC++ has a flexible application wizard AppWizard and a complete basic class library MFC, and integrates OpenGL graphics standards, which can provide a visual window interface and basic input and output Function, to make up for the shortcomings of OpenGL, using VC++ can generate a window, this window can display graphics images and their operations on the computer screen.

##### 4.2. Virtual reality technology psychotherapy system framework

The virtual reality psychotherapy system can be divided into four modules: sound, graphic image, interactive control, and behaviour prompt. The system framework is shown in Figure 2. The sound module mainly contains the interactive sound of the person being treated with the treatment system in the virtual environment, such as greeting a character in the simulation scene, he will give you a certain response, and you will hear water when washing your hands. It also includes environmental sounds such as special music, ocean waves and seagulls. These sounds form a sound database for the system to call [6]. Graphics and image modules are mainly some model data files built by OpenGL and 3DMAX software. This is the core of the entire system, and whether the simulation effect is good or bad is closely related to it. The quality of interactivity is also an important indicator for judging

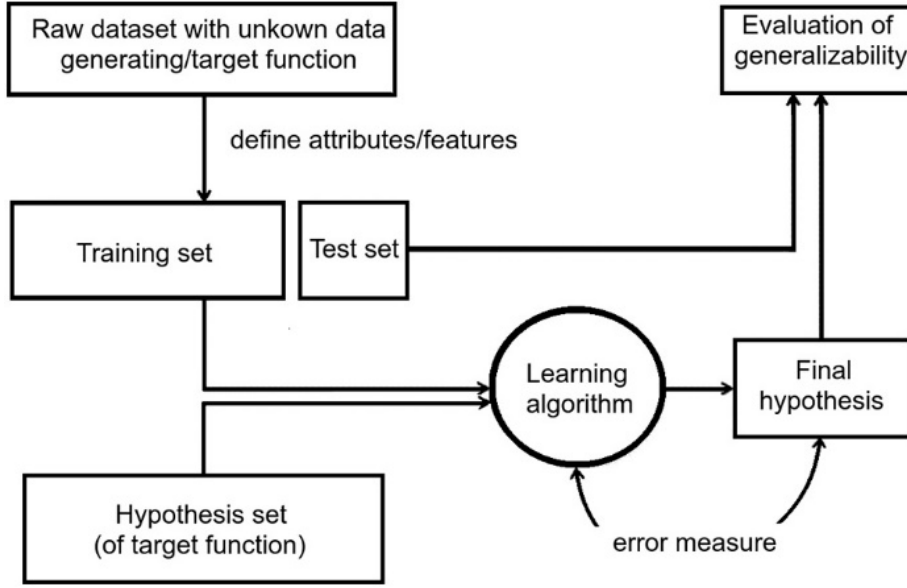
the success of a system. A good interaction function can enable the system to obtain more complete information about the patient's needs, and the system can also feedback the help information to the patient in time. The behavioural reminder module can provide vivid and warm reminders to patients. For example, when a patient is undergoing meditation treatment, the teacher in the virtual environment can tell him how to meditate breathing and give demonstrations. When the patient is receiving exposure therapy, the virtual psychotherapist in the system will continue to forcibly restrict or correct certain behaviours of the patient.



**Figure 2.** Psychotherapy system framework

### 4.3. Module function design

The module function design is mainly based on the overall MVC framework, comprehensively considering the functions and structure of the program to the scalability of the program, and the specific design of each function module. The overall functional hierarchy of the system is shown in Figure 3. The system is divided into several modules: registration, login, consultation, appointment, evaluation, encyclopaedia, and message. There are specific branches under the modules to realize specific functions. The most important modules are the evaluation function module and the consulting function module. The evaluation function is mainly to realize the online psychological evaluation of patients. The evaluation scores are divided into four categories: fun evaluation, emotional evaluation, workplace evaluation, and personality evaluation. Most of the evaluation content is fun evaluation. The purpose is to allow patients to keep relaxed while analysing their psychological conditions. The mood of entertainment [7]. The evaluation module includes evaluation homepage, evaluation list page, and evaluation content page. The consultation function module enables the patient to conduct psychological consultation with the counsellor online. The patient can view the basic information of the counsellor, personal honours, and areas that are good at counselling, etc., so that they can choose a counsellor that suits them for consultation. While realizing the function, the page making page has realized a simple animation. This may make patients more willing to consult and pay attention to their mental health.



**Figure 3.** System function hierarchical structure diagram

## 5. Design of automatic mental health assessment algorithm

### 5.1. Calculating the frequency of mental problems

The frequency of each psychological problem in the computer system in samples of different mental health categories. Specifically, for the sample  $\{p^i = \langle t_1^i, t_2^i, \dots, t_k^i, \dots, t_{n_i}^i \rangle, i = 1, 2, \dots, |D|\}$  in the training set,  $|D|$  represents the number of samples,  $n_i$  represents the text length in question  $p^i$ , and  $t_k^i$  represents the  $k$ th word in the question  $p^i$ . The frequency  $TF(l, c)$  of psychological problems  $l$  appearing in sample category  $c \in \{crisis, red, amber, green\}$  in the dictionary of computer systems is defined as formula (1)

$$TF(l, c) = \frac{\sum_{i=1}^{|D|} \sum_{j=1}^{n_i} 1_l(t_j^i) 1_c(p^i)}{\sum_{i=1}^{|M|} n_i 1_c(p^i)}, 1_A(x) = \begin{cases} 1, & x \in A \\ 0, & x \notin A \end{cases} \quad (1)$$

### 5.2. Calculate the standard deviation of mental problems

Calculate the standard deviation of the frequency of occurrence of each part of speech in different mental health categories in LIWC, which is used to measure the difference of LIWC psychological problems in different mental health categories. The larger the standard deviation, the more effectively the LIWC psychological problem can distinguish the sample belongs to Mental health category. Since the absolute difference in the frequency of different LIWC word categories on the data set is relatively large, when calculating the standard deviation, use the maximum frequency of the LIWC mental problem in the different mental health categories for normalization. Specific The calculation is shown in formula (2).

$$\begin{aligned} \delta_i^2 &= \sum_c [TF'(l, c) - \mu]^2 \\ TF'(l, c) &= \frac{TF(l, c)}{\max_c TF(l, c)} \\ u &= \frac{\sum_c TF'(l, c)}{\Sigma 1} \end{aligned} \quad (2)$$

Among them,  $TF'(l, c)$  represents the normalization of  $TF(l, c)$ , and  $\mu$  represents the average of the normalized frequency of psychological problems  $l$  on all four types of samples.

### 5.3. Psychological problem screening

We choose the highest top-k LIWC parts of speech as language features. The experiment selects the first k words as candidate features according to the order. It is found that the effect is best when k=28. Therefore, in F3-TMH, only 64 LIWC mentality the 28 most discriminative psychological problems are selected as language features. Table 1 is the top 10 LIWC psychological problems in  $\delta_1$ , including personal pronouns, physiological process words, social process words, cognitive process words and so on. Finally, among the linguistic features of training sample or test sample  $p^i$ , the feature value corresponding to psychological problem l is  $LGF(l, p^i)$ , as shown in equation (3).

$$LGF(l, p^i) = \frac{1}{n_i} \sum_{j=1}^{n_i} 1_l(t_j^i) \quad (3)$$

**Table 1.** The standard deviation of some LIWC psychological problems on the four types of samples

Rank	Psychological problems	Standard deviation
1	Relig_c	0.433
2	Death_c	0.3861
3	You_c	0.3787
4	Freesds_c	0.3658
5	We_c	0.3518
6	Ingest_c	0.3247
7	Assent_c	0.3192
8	Sexual_c	0.2846
9	Money_c	0.276
10	Angel_c	0.2469

## 6. Conclusion

This article is based on cognitive theory and chaos theory, and uses OpenGL and VC++ virtual reality technology to design a theoretical framework for psychotherapy. It is hoped that through this method, a new way to treat patients' mental illness can be explored, so that patients can truly find their own psychology. The root of the problem, to achieve the purpose of making the "heart disease" self-healing.

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Study on the early physical and mental health Care mechanism of poverty rural children in Yunnan Province under healthy China (ZX20210147).

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