

Exploration of Digital Game Design in the Field of Depression Based on Bibliometric Analysis

Yuanyuan Guo^{1*}, Huidong Ma¹

¹ College Architecture Art Design, Inner Mongolia University of Science and Technology, Baotou, China

Email Address

421715279@qq.com (Yuanyuan Guo)

*Correspondence: 421715279@qq.com

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Abstract:

The article carries on the literature metrological analysis to the number game design in the depression treatment domain related literature, summarizes its theoretical foundation, the research hot spot and the front tendency. Literature retrieval was carried out in the core database of Web of Science, and literature metrological analysis was carried out with VOSviewer and CITESPACE software. Theoretical Base models, research hotspots analysis, and development trend prediction were developed.

Keywords:

Digital Game Intervention, Digital Game Design, Treatment of Depression, Bibliometric Analysis, Depression

1. Introduction

With the development of digital technology, more and more medical fields begin to apply digital technology [1], depression as a mental disease, has a high risk, and will have a great negative impact on patients and their families' lives. Digital technology has great benefits in improving the effectiveness, efficiency, cost, and attractiveness of mental health interventions [2]. Game intervention with its entertainment may provide patients with higher attraction, increase the degree of cooperation in treatment, reduce the cost of treatment.

2. Method

2.1. Research methods

Bibliometric analysis is a quantitative research method, through the authors, references, keywords, journals, cited times and other document elements of the network structure, using the external characteristics of the literature, through mathematical and statistical analysis, can be used to describe, evaluate, predict the status quo and trend of research.

Data were obtained through Web Of Science (WOS) , literature data were co-cited using Vosviewer software, keyword co-occurrence was visualized, and keyword mutation was presented using CITESPACE software, the results were used to analyze the research hotspots and frontiers.

2.2. Data sources

Data for this study was collected from the Web of Science Database (WOS) on August 9,2023. The data acquisition steps were as follows

(1) to test the scope of literature research, to select the core collection database, to use the advanced search, to use the game, Depression AND subject (TS) , the search formula is (TS = (games)) AND Ts = (Depression) .

(2) through the preliminary screening of the data obtained, we found that there are many studies on game addiction, although it is a negative factor that needs to be paid attention to when games interfere with depression, however, most of the studies are related to the occurrence of depression, and the relationship with intervention therapy is weak.

(3) an advanced search on the Web of science was conducted with the search terms of (ts = (games)) AND Ts = (Depression) NOT ts = (game addiction) , AND 991 articles were retrieved.

(4) the articles were included according to the inclusion criteria, inclusion criteria: Serious Games, therapeutic games, research on game testing (including usability testing, diagnosis) , research on indirect interventions for depression (such as reducing obesity, enhancing cognitive and physical abilities) , research on the effects of games on certain abilities (such as self-confidence, social interaction) , and other relevant non-drug therapies.

(5) according to the exclusion criteria, the exclusion criteria were: drug therapy, case reports, references less than 1.

(6) through further screening of literature titles, abstracts and full-text reading of some literatures, a total of 517 papers were included.

3. Results

3.1. Annual publication

The total number of samples in this study was 517. The first article appeared in 2003. Overall, the volume of research publications after 2015 shows a clear upward trend, and can be divided into two phases.

The first stage is from 2003 to 2015, the number of papers published fluctuating growth, a total of 107 articles published, the annual average number of articles is only 8, relatively small and slow growth. The second phase began in 2015, and the number of articles published grew rapidly. As of the date of data collection, August 9,2023,410 articles had been published, an average of 45 articles per year, a more than fivefold increase over the first phase. This indicates that research activities in this field have begun to receive more attention in recent years.

3.2. The theoretical basis of digital game intervention in the treatment of depression

A total of 21459 references were included in the study, and 51 references with a total citation frequency of not less than 10 were selected to generate a total citation network. Cluster # 1(Red) , mental assessment tools study, cluster # 2(Green) emotional and emotional research, cluster # 3(Blue-RRB- psychological theory study, cluster # 4(yellow) game design study.

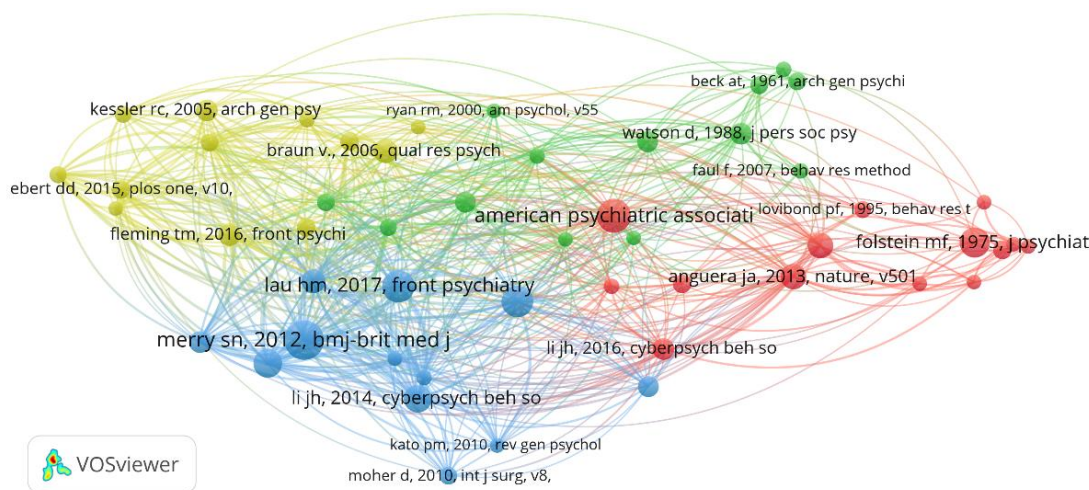


Figure 1. Reference co-citation clustering (self-drawn).

Cluster 1, mental assessment studies, there are many diagnostic methods of mental disorders, of which two are widely used, one is the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM-RRB- , which has evolved over the years since its publication in 1952, through gradual revision to DSM-5 published in 2000, followed by a revised version of DSM-5 released in 2013, and has since been in a state of dynamic updating [3]. The other is QIDS [4] , which can be used as self-report and also as the standard of clinician evaluation. In addition, the mini-mental state examination (MMSE) , Hamilton rating scale for depression (Hamd)24-item version and other evaluation methods have also been used for clinical diagnosis of depression.

clustering 2, emotional emotion studies, David Watson et al proposed a method for measuring positive and negative emotions in a study published in 1988 with the Panas Scale [5]. Later, in 2003, Gross et al developed the emotion regulation scale to measure the frequency of cognitive reappraisal and expression inhibition, making the measurement of emotion more comprehensive [6]. The emotional function of patients with depression is still present and normal, but they are prone to disorder in the regulation of emotion [7]. Most populations have habitual selection tendencies when they engage in emotional regulation, whereas patients with depression are more likely to choose low positive emotional tendencies when they engage in emotional regulation [8] .

cluster 3, psychological theory research, there are two basic psychological theories for the design of number games, a. The uses and gratifications theory, first proposed by Elihu Katz in 1959, is the process of making choices based on needs to be satisfied, and was originally applied in the field of communication. b. The theory of flow experiences, first proposed by Csikszentmihalyi, refers to an almost automatic, highly focused state of consciousness that causes people to ignore time, worry, and other factors [10]. M. J. Koepp [11] demonstrated in experiments from a neuropsychological perspective that number games produce endorphins and striatal

dopamine, which are responsible for the secretion of pleasure and well-being hormones, providing positive evidence that number games intervene in depression.

cluster 4, Game Design Research, therapeutic game design is an integrated research area that requires multi-domain co-engagement in order to produce more autonomous digital therapeutic games [12]. The combination of sports and cognitive therapy in the design of digital leisure games can attract users' attention through the entertainment and interaction of games, and achieve the purposes of psychotherapy and emotion management in a more relaxed way [13]. Carmen v. Russoniello proposed a digital game design method for people with depression, that is, game design based on user data, focus groups, sales data and other feedback information. This approach allows games to be adjusted and improved based on user needs and feedback.

3.3. Hot and cutting edge trends in digital game design in the field of depression

3.3.1. Analysis and interpretation of keyword co-occurrence

There were 2446 keywords in 517 articles. After the synonyms were unified, 77 keywords with more than 10 times were screened out, and 75 keywords were excluded to form a co-occurrence map. As shown in Figure 2, four clusters of research hotspots are formed, # Cluster 1(Red) : Adolescent Mental Health and play intervention, # Cluster 2(Green): Assessment of rehabilitation and cognitive health in older adults, # cluster 3(Blue): Efficacy and design of treatment for mood regulation and psychological disorders (very similar to purple clusters, merged into the same cluster) , # cluster 4(yellow): virtual reality and physical activity studies.

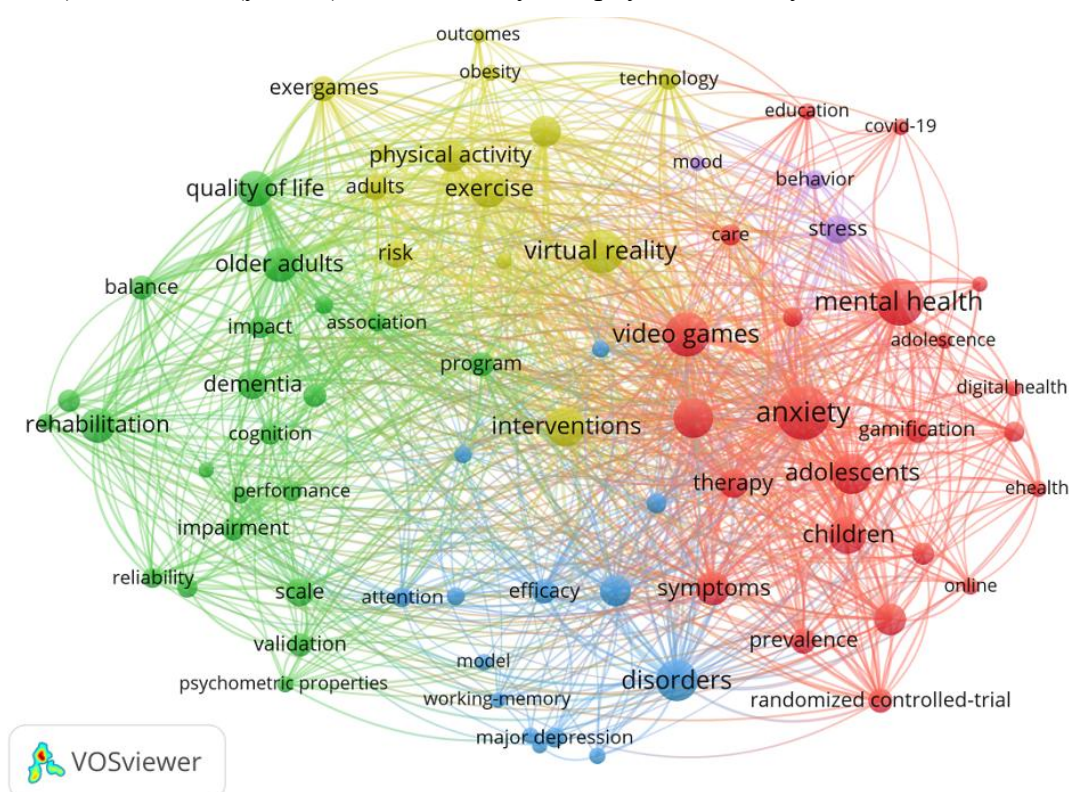


Figure 2. Keyword co-occurrence diagram.

Cluster # 1 adolescents' mental health and game intervention, a cluster containing 23 keywords, mainly including anxiety (anxiety), mental health (mental health), video

games (Digital Games), adolescents (adolescents), and others. In the study of adolescents' mental health interventions, the gaming approach has been widely used. Many studies have called the game approach to disease intervention serious play, and have classified it as either numerical or non-numerical. For example, Veronika Brezinka [16] created a "Treasure hunt" number game for cognitive behavioral therapy based on learning theory. The game mainly through educational means, so that adolescents understand and the meaning of the terms related to mental illness, so that more with the understanding of follow-up treatment and cooperation.

Cluster # 2 depression rehabilitation and play intervention in the elderly, this cluster contains 22 keywords, mainly including quality of life (quality of life) , older adults (elderly) , rehabilitation (rehabilitation) and other keywords. Gamification of activities and products can increase physical activity, cognitive stimulation, and positive emotions in older adults through their targeted design, effectively reducing depression and improving quality of life [17]. As Yen H-Y [18] showed in a 2021 study that virtual reality (VR) sports games can significantly improve depression in older adults, but for-profit games such as commercial VR games are better at treating depression than VR sports games because they are more entertaining and interactive.

Cluster # 3: Efficacy and design of mood regulation and therapy for mental disorders. The cluster contains a total of 17 keywords, mainly including disorders, metaanalysis, stress and other keywords. Jobst a [19] has shown in studies that patients with depression develop more pronounced negative emotions after being socially excluded, thus negatively affecting depression. From the perspective of gender differences in mood, gender differences in digital mental health programs have been found in the acceptance and preferences of men and women are also different. For example, Smail-Crevier R [20] found that men prefer simple, direct, interactive and personalized design features, while women prefer detailed, warm, supportive and community-oriented design features.

Cluster # 4: Virtual Reality and physical activity research. The cluster contains 13 keywords, including virtual reality, Interventions, Exercise and so on. Impaired exercise capacity due to musculoskeletal disease affects patients' daily life and leads to psychological problems such as depression, and home-based training can reduce the use of medical resources when resuming training [21]; But it tends to lead to a decrease in continuity, so family training needs to improve continuity of training, such as the application of virtual reality [22] technology. Improved physical status can significantly improve depression due to physical disorders [23]. As Gui bin Song [24] introduced a VR game system into the rehabilitation training of stroke patients, experiments have shown that the addition of virtual reality can increase the enthusiasm of patients to participate in the treatment, and is accompanied by the recovery of body movement function, depression also improved.

3.3.2. keyword mutation analysis

CITESPACE keyword mutation map can effectively observe the development and change trend of research in the field. The starting time, mutation time and intensity of each keyword are shown in Figure 3. From the point of view of the starting time of mutation combined with the division of annual publication volume, there are two stages.

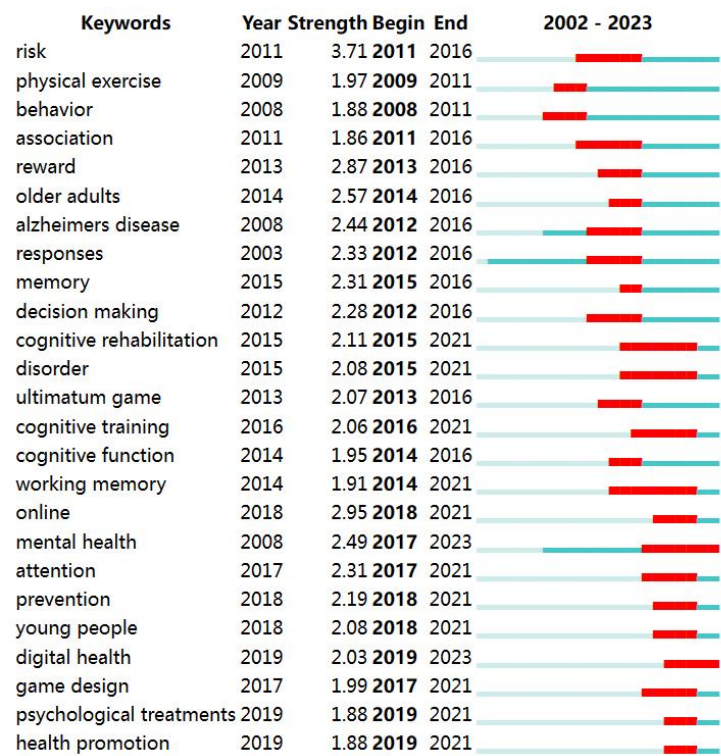


Figure 3. keyword mutation map.

The first phase, behavior, was the original research focus, starting in 2008 and falling into the category of keyword co-occurrence # 3, followed by physical exercise in 2009, the first phase of the study, from 2003 to 2015, was led by Cluster # 4 virtual reality and physical activity research, which focused on the intervention of games on depression-related diseases, less research has been done on game interventions for depression itself, with later studies turning to the role of Alzheimer’s disease, older adults, and reward mechanisms during training, finally began to undertake the second stage of cognitive rehabilitation (cognitive rehabilitation), cognitive rehabilitation research.

Phase 2: Cognitive Training Research began in 2016, followed by mental health in 2017 and Game Design in 2017. All three keywords belong to cluster # 1. The research focus of the second phase began to focus on the psychiatric research directly related to depression, and began to pay more attention to the digital game design related to the intervention of depression, focusing primarily on the cluster # 1 focus on adolescent mental health and gaming interventions, in 2018 began focusing on the depression component of young people's mental health and focusing on the prevention of depression research, then came research on psychological treatments, health promotion, and digital health.

The keywords that are still in the research hot spots are mental health and digital health, which may also become the research hot spots in the future, with mental health appearing in 2008 and the hot spots starting in 2017, it continues to this day, with the longest duration of the current research hotspots and more enduring momentum, after the digital health study emerged in 2019, the dual impact of increasing digital demand and technical support for the pandemic has created a continuing research hotspot and will continue to hold great potential for future research.

4. Discussion

4.1. The basic theory of game intervention in depression

The basic theory covers four aspects. The first, as shown in Figure 5, is a psychiatric assessment, including validated depression measurement tools such as DSM-5 and QIDS, which are highly sensitive and can be quickly identified and graded. The second is the research of emotion and emotion, which is helpful to evaluate the condition of patients accurately and emphasize the importance of emotion regulation in the treatment of depression. The third is the theory of psychology, with flow theory, use and satisfaction theory as a guide for digital game design, enhance the entertainment and appeal, and draw on cognitive model theory, social relations theory for the treatment of theoretical basis. Finally, the game design research on the treatment of depression, which emphasizes the cooperation in many fields, including medicine, design, programming and so on, and the active participation of patients and their families, to improve the targeting, effectiveness, safety, and scientific nature of digital game interventions. According to the position of the theory in the system, it can be divided into the theoretical core-the theoretical basis of treatment and diagnosis: The Theory of psychology, the theory of emotion and emotion; Rapid and accurate identification and treatment: the measurement and diagnosis of mental disorders scale; the realization form: multi-industry, multi-field cooperation and co-creation: Serious Game Design and development. From the basic level to the expression level, the systematic theoretical framework of game intervention for the treatment of depression is shown in Figure 4.

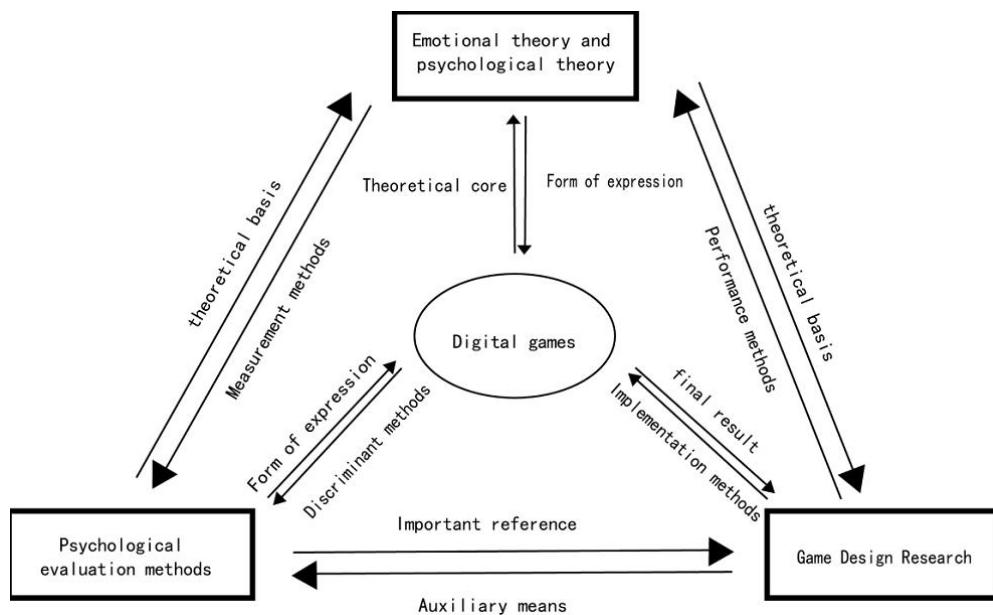


Figure 4. Theoretical framework.

4.2. The research focus of game design intervention on depression

Current research on game design interventions for depression focuses on adolescents and the elderly. Because of their high attraction to play and their relatively independent depressive condition, adolescents are more likely to accept play intervention therapy, and it is expected to achieve better therapeutic effect. Older adults, by contrast, have a low acceptance of new things because of their association

with other life problems and physical disorders, but the study found that gaming remains attractive to older adults and can enhance the sustainability of treatment.

In the aspect of treatment content, the research of emotion pays more attention to the influence of gender difference and emotion regulation habit on the treatment of depression. The emotion of patients with depression is easily influenced by the outside world, and the mobilization of positive emotion is very important for treatment. In addition, through the virtual reality physical activity exercise, for the physical function impairment caused by depression, has a better treatment effect.

4.3. Trends in game design interventions for depression

Digital game design in the study of depression, from the beginning of indirect physical intervention, gradually developed to direct psychological intervention, more accurate for depression. The initial research focused on the effects of game intervention on physical activities, such as behavior and physical exercise, on depression, and then gradually developed research on the mechanisms of feedback and reward during the process of game intervention, then there were studies of the effects of games on depression in older people, people with Alzheimer's disease, and other physical activities, since then, more research has been done on the effects of digital games, such as gamification cognitive rehabilitation and cognitive training, on depression in psychiatric interventions, and on the prevention of depression, currently in the field of digital health, the use of digital games in mental health interventions, especially in the prevention and treatment of depression.

5. Conclusions

Based on the Web of science core set database, this study basically combed the theoretical basis, research hotspots and development trends of game design in the field of depression, through the data processing and analysis of the included literatures by Vosviewer and CITESPACE software, the data were displayed in the form of graphs, and the four theoretical bases of the intervention of digital games on depression were obtained, the research of mental evaluation, emotion, psychological theory and game design; four research hotspots, research on adolescent mental health and game intervention, elderly depression rehabilitation and digital game intervention, efficacy and design of emotion regulation and mental disorder treatment, virtual reality and physical activity, and the development process, the development trend and so on. Future research should focus on the application of serious games in this field, game design of personalized, bio-feedback, virtual reality and other technologies to join.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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