

# DEPINV: A WeChat Applet for Online Intervention of Depression Based on Accept Cognition Theory

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## Abstract

**Background:** Studies have shown that the phenomenon of fetal malformations can cause serious psychological problems and even depressive symptoms of pregnant women during their perinatal period. Psychological studies have shown that involving these women into appropriate interventions and treatments can effectively alleviate their depressed symptoms. With the prevalence of mobile technologies and online social networks, practitioners and researchers have been dedicating to move the offline intervention strategies to online platforms for the treatment of depression caused by fetal malformations.

**System design:** We design an online Depression Intervention system (DEPINV), suitable for the online intervention of depressed woman suffering from fetal malformations. There are three main features in the design of DEPINV. First, it intends for the effective coordination and interaction among three types of user roles in order to reach a tripartite synergistic therapy effect. Second, it focuses on the assessment and monitoring of users' psychological state, and the Accept Cognition Theory (ACT) is introduced into the design of the system for the intervention. Third, various communication channels are provided to assist users' coordination and ACT based intervention.

**System implementation:** To make the access easy and flexible, we adopt the WeChat applet as the development and deploying technical framework. Therefore, DEPINV is a WeChat applet that can be accessed by simply scanning the Quick Response (QR) code. It cooperates three types of users, the healthcare providers, depressed women and their family members. That is, DEPINV helps healthcare providers to maintain and manage the psychological states of depressed women with the involvement of their family members. There are six successive stages in the core function of the ACT based intervention and each target for the accomplishment of one specific psychological state. Through the comprehensive management of treatment procedure, DEPINV applet helps healthcare providers record and monitor the dynamic change of patients' affections. To cope with the negative emotions of depressed women, various channels of information support, social support and emotional support are also provided for instant communication between healthcare providers and family members.

**Conclusion:** The DEPINV applet provides effective online interventional strategies and treatments for depressed women with the help of both healthcare providers and their family members. When more interventional features and functions are included, it is necessary to extend the applet into a mental health app.

**Keywords:** Online depression intervention • WeChat applet • ACT

## Background

According to the White Paper on Mental Health of Urban Residents in China, 10.3 percent of the country's populations have been suffering from some type of mental illnesses [1]. Among them, more than 264 million Chinese people worldwide have been suffering from depression, which is a leading cause of poor health and disability worldwide [2,3]. With the conduct of the "third baby" policy released by the Chinese government, the type of perinatal depression caused by the fetal malformation during the pregnant period has become prevalent.

Fetal malformation during pregnancy will cause serious adverse psychological reactions to both the mothers and their family members, which will become worse in the late pregnancy, and even cause maternal depression and more severe symptoms [4,5]. With the help of professional

healthcare providers, the depressed symptoms can be alleviated with less physical pain, relieved psychological pressure and reduced psychological burden. Therefore, it is very necessary and important to grant appropriate psychological treatments to the maternal women, as has also been proved to be acceptable and effective in clinical practices [6,7].

With the rapid development of Internet technologies, online social networks have exerted higher and higher impact on Chinese people's attitudes toward medical treatment and on changing their health behaviors [8,9]. With the advantages of large volume of audience, high user participation and high retention rate, online social networks have also been widely adopted to promote public health [10]. For instance, compared with offline friends and family members, users would more like to discuss their problems in online social networks (such as WeChat) [11]. And compared to the offline environment, online users are exposed to more sources of positive social influence and fewer sources of negative social influence [12].

WeChat is one of the largest online social networks for instant messaging services [13,14]. The monthly active accounts of WeChat are 1.2 billion, with an increase of 8.2% year on year. As a representative form of social networks, WeChat has become an integral part of the daily lives of Chinese people. And it has shown potential impact on changing health behaviors of its users [15]. As WeChat applet is easy to be integrated into WeChat, there is a rapid growth of applet users. Intervening through WeChat applet is not only cost effective and convenient, but also shortens the treatment time [16-18].

Based on the above advantages, we design and implement a WeChat applet, Depression Intervention system (DEPINV) to carry out online intervention for depressed women caused by fetal malformation. As family members should

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also be involved, DEPINV is designed to coordinate not only the healthcare providers with depressed women, but also the healthcare providers with their family members to reach a tripartite synergistic therapy effect [19]. Healthcare providers distribute online questionnaires to depressed women before and after accepting the intervention. Healthcare providers can get in touch with the family members to provide better treatment and social support. Family members can also follow the treatment procedure of depressed women and ask questions to healthcare providers, in order for instant and better treatment of the depressed women.

Focusing on the assessment and monitoring of users' psychological state, we introduce the Accept Cognition Theory (ACT) into the development of the system and design ACT based intervention strategies. Therefore, there are six successive modules in the core function of DEPINV and each module targets for the accomplishment of one specific psychological state in the ACT based intervention strategies. There are six successive stages in the ACT intervention, the acceptance, the cognitive defusion, the being present and the self as context, the values and committed action. The six units will be carried out in dynamic collaboration among healthcare providers, depressed women and their family members.

## Related therapies

Before introducing the system, we categorize and compare four types of therapies for depression, the anti-depression drugs, the Cognitive Behavioral Therapy (CBT), the Vagus Nerve Therapy (VNS) and the Acceptance and Commitment Therapy (ACT).

Antidepressant drugs, as the main treatment of depression can effectively relieve the symptoms of depression. Since the 1950's, the treatment of depression has mainly relied on antidepressant drugs based on the monoamine hypothesis, such as monoamine oxidase inhibitors, tricyclic drugs and selective serotonin (5-HT) reuptake inhibitors [20]. There are also many limitations and shortcomings, including relatively low efficiency, multiple side effects and time lag for treatment [21]. For instance, one of the studies have shown that less than one third of the patients responded to the antidepressants for the first treatment [22,23]. Even if patients attained the initial clinical cure, there is still a high risk of depression recurrence up to 50% while the recurrence rate after the second onset is higher [23].

Cognitive behavioral therapy (CBT) is based on the cognitive theory of emotional disorders. It believes that people's thoughts and beliefs are the rooted causes of emotion and behavior, and the dysfunctional cognition leads to emotional disorders and inadaptability [24]. Studies have shown that CBT can help patients adjust their cognition of the reality, reconstruct reasonable, positive and adaptive ideas, and guide patients to correctly evaluate themselves and the outside objective things. CBT also helps patients learn to explore outside resources and seek help to deal with problems in a positive way, thereby improving treatment compliance [25]. However, the current study of CBT intervention for depressive individuals is mostly combined with drug therapy, and the study of CBT alone is less compared with antidepressant drugs [26]. It is unclear which type of depressive patients are more suitable for CBT treatment, which needs further study.

Vagus nerve therapy (VNS) is a kind of invasive treatment, where a pacemaker like pulse generator is implanted in the chest, and connected to a stimulation electrode located in the cervical vagus nerve. Via electrical stimulation of the vagus nerve and through the solitary tract nucleus, it will finally exit the corresponding cerebral cortex and subcortical structure [27]. In 2005, Food and Drug Administration (FDA) set out to approve VNS for the treatment of chronic or recurrent adult depression [28]. And at present, this treatment method has been applied to the treatment of major depression and drug resistant epilepsy which has been proved to be effective. However, there are also many shortcomings in the conduct of the VNS treatment such as slow onset, side effects and so on. Studies reported that the response rate of VNS to depression was 31.8%, with an average onset time of more than 9 months [29]. Another study showed that only 35%

of the first three months of VNS treatment were effective, while 65% and 50% of these patients remained effective at 12 and 24 months, respectively [30]. In addition, VNS has many adverse reactions such as pronunciation changes, dyspnea, neck pain and cough [29].

Compared with the above treatment methods, ACT intervention has the advantages of low cost, obvious effect and small side effects. The ACT intervention (Acceptance and Commitment Therapy), includes six core procedures: the acceptance, the cognitive defusion, the being present, the self as context, the values and the committed action. ACT was proposed by the American physician Steven C. Hayes and his colleagues in 1986 [31,32]. They advocate that healthcare providers allow the patients to accept pain in a positive manner. People accept the cognition that people cannot be in a state of happiness forever, and re-establish and realize their own values [33]. At present, ACT therapy has been widely used in the intervention treatment of depression and autism with the advantages of good efficacy, low cost and high individual satisfaction [34].

The ACT intervention in this study refers to the professional psychological intervention related to the acceptance and commitment therapy (ACT). That is, the healthcare providers briefly introduce the ACT and the intervention content during the verification period. They then guide the patients to identify the negative emotions and initially experience the mindfulness breathing exercises to concretize the painful emotions. They observe the ideas through the exercises, and guide the patient's cognitive dissociation. In the decision making period, the healthcare provider makes patients understand that that avoidance and control are ineffective and guides patients to accept via analysis. Via metaphor the healthcare provider can further help patients observe their own inner experience and guide them to be 'self as context'. In the recovery period, metaphor assists to enhance the patients' conscious awareness and mindfulness exercises can help patients clarify values as well as develop goal commitment actions. It is mainly reflected in the medical staff uploading treatment related audio through the functions in the applet, and 'urge' patients timely review.

## Methods

### Design

As one of the most popular online social networks, WeChat has a wide range of users. After logging in WeChat account, users do not need to install WeChat applet. Instead, they can enter the applets directly by scanning QR codes. That is, WeChat applet provides convenient and cost effective way to get access and conduct depression intervention. Therefore, we intend to implement our intervention system, DEPINV by adopting the development framework of WeChat applets.

To develop a WeChat applet, we first register and obtain the AppID. The overall developing architecture is shown in Figure 1. According to the B/S framework [35], three layers should be implemented, the front end customer layer, the intermediate application layer and back end database layer. In terms of the front end customer layer, we adopt the technical solution of WeiXin Markup Language (WXML), Wireless Application Protocol Cascading Style Sheet (WCSS) and JavaScript (JS) and use Eclipse as the developing tool. In terms of the intermediate application layer, we rent and deploy our application in the cloud servers. Finally, in terms of the back end layer, Tomcat has been running in cloud servers and the cloud databases of MySQL (Structure Quest Language) are rented to store the data entered by the users (Table 1).

DEPINV is designed to coordinate not only the healthcare providers with depressed women, but also the healthcare providers with their family members to reach a tripartite synergistic therapy effect. Therefore, there are three types of users, the healthcare providers, depressed women and their family members. For the effective coordination among three types of user roles, we design the tripartite interaction as is shown in Figure 2.

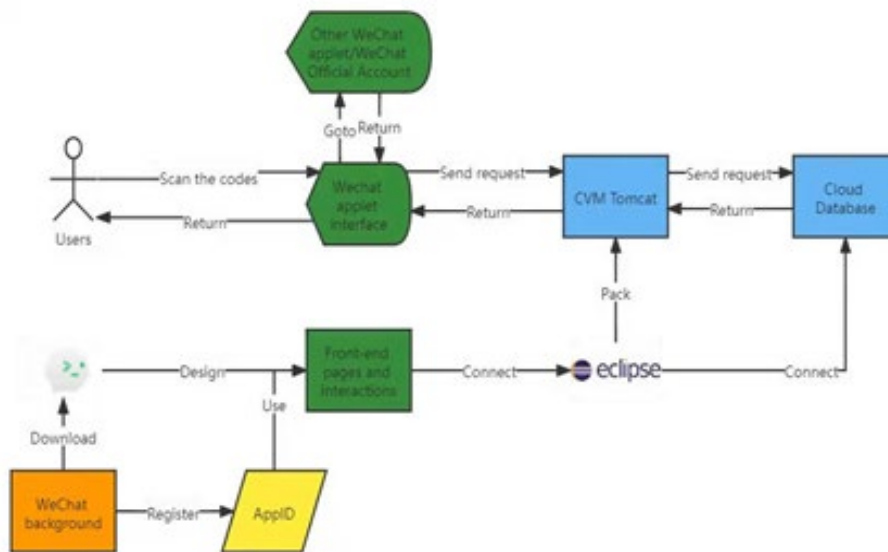
In terms of the coordination between healthcare providers and depressed

women, when the depressed women join the intervention, the healthcare providers will release the online questionnaires to them. After they complete the questionnaires, healthcare providers shall get feedback, upload the relevant treatment audio of the corresponding unit, and urge the depressed women to review it in time. After the depressed women complete the intervention for a certain time, healthcare providers will issue new online

questionnaire to them again and analyze the questionnaire so as to decide whether the depressed women should enter the next stage. In addition, through “Q and A”, depressed women can also ask questions so that healthcare providers give answers and suggestions. Healthcare providers can also upload relevant articles for depressed women to learn the relative knowledge and understand their situation better.

**Table 1.** Review of relevant therapies of depression.

The name of therapy	Use-method	Patient participation	Healthcare provider participation	Clinical effect
Antidepressant drugs	<ul style="list-style-type: none"> <li>monoamine oxidase inhibitors</li> <li>tricyclic drugs</li> <li>selective serotonin (5-HT) reuptake inhibitors[20]</li> </ul>	low	low	Limitations include: <ul style="list-style-type: none"> <li>relatively low efficiency</li> <li>drug resistance</li> <li>multiple side effects and time lag for treatment[21].</li> </ul>
CBT	<ul style="list-style-type: none"> <li>adjust their cognition of reality</li> <li>reconstruct reasonable and positive ideas</li> <li>guide to correctly evaluate themselves and objective things</li> <li>learn to explore resources and seek help to deal with problems in a positive way[25]</li> </ul>	high	high	<ul style="list-style-type: none"> <li>combine with drug therapy</li> <li>CBT alone is less compared with antidepressant drugs</li> <li>unclear the applicability of CBT treatment</li> </ul>
VNS	<ul style="list-style-type: none"> <li>implant a generator in the chest</li> <li>connect it to a stimulation electrode located in the cervical vagus nerve</li> <li>stimulate the corresponding cerebral cortex and subcortical structure[27]</li> </ul>	low	low	Adverse reactions [29]: <ul style="list-style-type: none"> <li>pronunciation changes</li> <li>dyspnea</li> <li>neck pain</li> <li>cough</li> </ul>
ACT	<ul style="list-style-type: none"> <li>accept pain in a positive manner</li> <li>accept the cognition that people cannot be in a state of happiness forever</li> <li>re-establish and realize their own values [31]</li> </ul>	high	high	<ul style="list-style-type: none"> <li>good efficacy</li> <li>low cost</li> <li>high individual satisfaction</li> </ul>

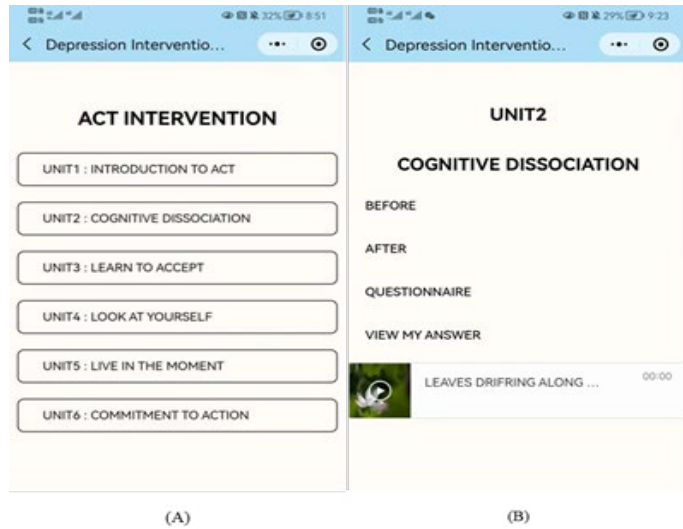


**Figure 1.** Technical architecture of WeChat applet development.



the questionnaires were fed back to the healthcare providers again, as shown in Figure 5.

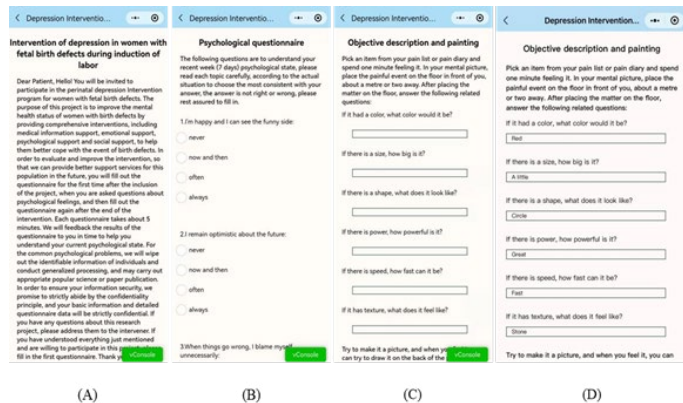
To accept ACT based intervention, depressed women login in the system and enter the ACT world. They can enter the unit based on their therapy schedule. The overall flowchart conducted by the depressed women is shown in Figure 6. And the corresponding operations in DEPINV are shown in Figure 7.



**Figure 7.** “Act Intervention” page (A) Depressed women select unit to accept ACT intervention in this page. (B) Depressed women accept “UNIT2 COGNITIVE DISSOCIATION” and get audio resources in this page.

If the selected unit is open, the corresponding questionnaire and audio resource of this unit are available to get. Otherwise, the system will show “NO”. Then if depressed women are willing to complete the questionnaire, they will receive a feedback by their healthcare provider. Otherwise, the system will stay on the current page. After depressed woman fill out all questionnaires, the system will show “SUCCESS” finally.

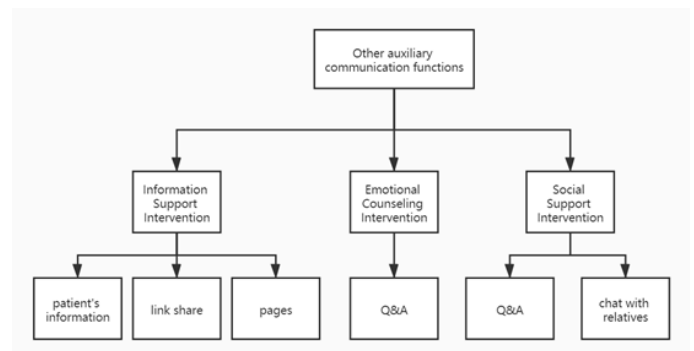
After patients logged in to the system, they cooperate with the online ACT intervention provided by the medical staff through the applet, which is six units too as shown in Figure 7. When patients enter each open unit, they can see the questionnaires issued by the attending healthcare provider to themselves. These questionnaires are divided into pre-intervention, post-intervention and “objective drawing” as shown in Figure 8. After filling in the questionnaire, patients can see their own answers, and then get feedback from healthcare providers that are whether they will enter the next stage of ACT intervention. In addition, patients can obtain and relish the audio resources of the unit which means further receiving the ACT intervention.



**Figure 8.** “Act Questionnaire” page. (A) Pre-intervention questionnaire. (B) Post-intervention questionnaire. (C) “Objective drawing” questionnaire. (D) The answer of “objective drawing”.

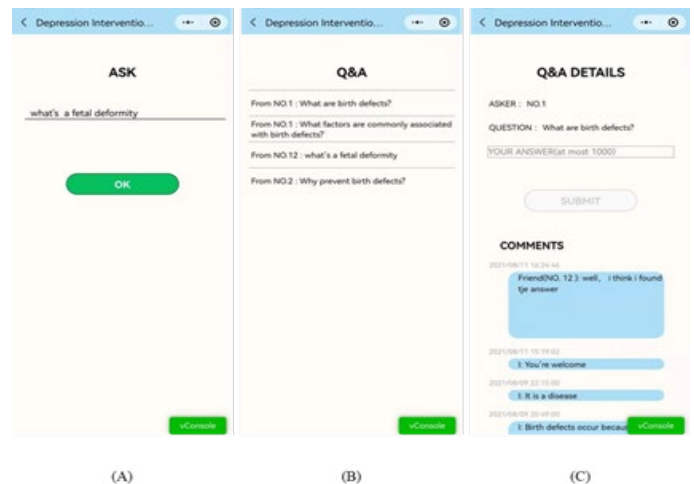
## Communication channel

Finally, the last but not the least important feature of DEPINV is that, various communication channels are provided to assist users’ coordination and ACT based intervention. Compared to other mental health procedures, the system introduced wide intervention methods, including information support intervention, emotional counseling intervention and social support intervention to assist communication of three sides. Among them, information support intervention is mainly reflected in the uploading of depressed women’s information, links and pages by healthcare providers in the WeChat applet. Emotional counseling intervention and social support intervention both have “Q and A” part, which is mainly reflected in healthcare providers to communicate and interact with depressed women and to provide them with psychological counseling. In terms of family members, healthcare providers can also communicate with them in time through “chat with relatives” part to comprehensively monitor the degree of recovery, so as to realize emotional counseling and social support intervention (Figure 9).



**Figure 9.** Other functions for auxiliary communications.

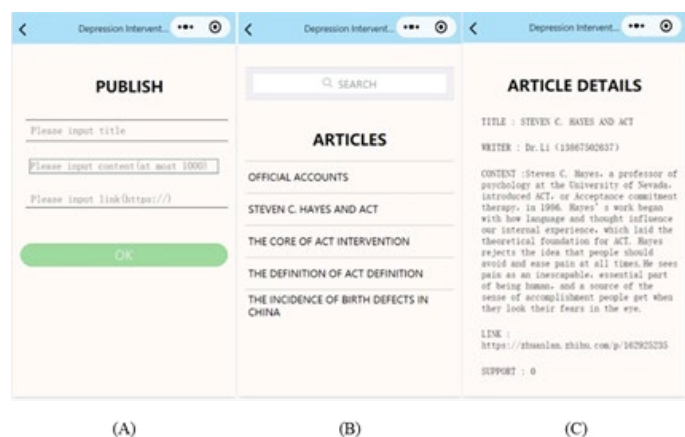
To better support the implementation of intervention strategies, we also design various channels of information support, social support and emotional support. There is a “Q and A” platform between healthcare providers and depressed women, where depressed women can ask healthcare providers questions; then healthcare providers can answer them. Between healthcare providers and family members, healthcare providers can get the contact information of depressed women’s family members through the platform. If necessary, healthcare providers can get in touch with the family members to provide better treatment and social support. Family members can also inquire about the treatment process of depressed women through the specific page and ask questions through “Q and A”, so as to jointly assist depressed women with better treatment, as shown in Figure 10.



**Figure 10.** “Q&A” page. (A) Depressed women ask questions in this page. (B) Healthcare providers answer questions in this page. (C) Healthcare providers answer questions in this page.

providers view the details of questions in this page.

At the same time, we also set up an article sharing platform in this applet. Healthcare providers can publish popular science articles on this platform, and depressed women and their families can read. If they like one article, they can give the article likes, as shown in Figure 11.



**Figure 11.** "Articles" page. (A)Healthcare providers publish articles in this page. (B)Depressed women and relatives read articles in this page. (C) Depressed women and relatives read the details of articles in this page.

## Discussion

As one of the most popular online social networks in China, WeChat has obtained a huge number of users and it has shown great potential in changing users' health behaviors. Intervening through WeChat applet has presented many advantages. First, applets are easily accessed by scanning QR codes at any time and at any place, and thus suitable for cultivating user behaviors. As users can reserve time slots of online intervention, reducing the waste of time such as offline transportation, registration and so on. Despite of the advantages, as applets are lightweight with only limited functions, it is necessary to extend DEPINV to mobile applications when complex functions are required.

DEPINV intends to reach a tripartite synergistic therapy effect among healthcare providers, depressed women and their family members. The difference between our applet and other systems is that we not only target healthcare providers and depressed women, but also design the pages of family members. Family members bind the corresponding depressed women through the "BIND" function, view their treatment stage and realize social support intervention. Healthcare providers can get the contact information of family members through the "CHAT" function, which facilitates the communication according to the situation of depressed women. The synergistic effect and information sharing facilities mutual understandings and empathy.

Finally, ACT based intervention strategies are implemented in DEPINV applet. In recent years, ACT plays a significant role in the treatment of depression; it is not only a unique way of psychological intervention, but also a new technology in the field of psychotherapy. In previous studies, it was found that few applets would be combined with ACT. Therefore, our applet combines with ACT, there are six modules in the core implementation of the DEPINV platform, and each module designs questionnaires and relevant audio, grasps the progress management of intervention implementation, and comprehensively manages the treatment process of depressed women.

In the future work, DEPINV will be used in clinical practices to assist practitioners and healthcare providers conduct the intervention. Our applet has many psychological measurement functions, with the main purpose of auxiliary regulation. In addition, in order to know whether the depressed

women's problems are completely cured, we plan to add a three stage tracking and follow up function. The healthcare providers will keep in contact with their depressed women and conduct psychological inquiry at three time points of one year, three years and five years. When the depressed women decide to use the applet, we can sign an agreement with them, but the development of this function requires high information maintenance. We need to ensure long term contact with depressed women and ensure that their information is kept confidential. Of course, in the later development process, as our applet becomes more and more mature, we also try to use the project in parallel with mental a health app, which can fulfill a wider range of users' needs and retain the advantages of the applet [36-39].

## Conclusion

To conclude, the DEPINV applet provides effective online interventional strategies and treatments for depressed women with the help of both healthcare providers and their family members. Healthcare providers use the applet to conduct ACT based online intervention so that depressed women can participate. Their family members will also be involved into the treatment by scanning the shared information and using the communication channels of the applet. Therefore, DEPINV is intended to reach a tripartite synergistic therapy effect between healthcare providers, depressed women and their family members. When more interventional features and functions are included, it is necessary to extend the applet into a mental health app.

## Availability and Requirements

### Project name

DEPINV (Depression Intervention system).

### Operating systems

Platform independent

### Programming language

Java, WXML, WXSS, JS, JSON.

### Other requirements

Java 10.0 or higher, Tomcat 8.0 or higher, wechat account, Wechat Devtools.

### License

SP, GNU, GPL etc.

### Any restrictions to use by non-academics

Licence needed, wechat account needed.

## Ethics Approval and Consent to Participate

Not applicable.

## Consent for Publication

Not applicable.

## Competing Interests

The authors declare no conflict of interest.

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China (Grant NO.71904174).

## Authors' Contributions

Xu and Zhang designed the overall framework of the system. Zou, Tan and Zhu implemented the system. All authors wrote and revised the manuscript.

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## References

- White Paper on mental health of urban residents in China (2021).
- World Health Organization, "Depression," (2020).
- World Health Organization, "'Depression: Let's talk' says WHO, as depression tops list of causes of ill health," *Mar. 30, (2017)*.
- Huilian, Bu, "Maternal depression in stillbirth and fetal malformation induced labor. World Latest Medical Information Digest." *Med Dig 84(2018):2018*.
- Howard, LM and Khalifeh H "Perinatal mental health: A review of progress and challenges." *World Psychiatry 19(2020):313–327*.
- Cuijpers P and Karyotaki E. "The effects of psychological treatment of perinatal depression: An overview." *Arch Womens Ment Heal 24(2021):801–806*.
- Gorayeb, RP, Gorayeb R, Berezowski AT and Geraldo D. "Effectiveness of psychological intervention for treating symptoms of anxiety and depression among pregnant women diagnosed with fetal malformation." *Int J Gynecol Obstet 121(2013):123–126*.
- Noar, SM. "A 10-year retrospective of research in health mass media campaigns: Where do we go from here?" *J Health Commun 11(2006):21–42*.
- Jintao, Z, Chao C, Lingjiao W and Liu L, et al. "The relationship between time spent online and internet addiction among chinese college freshmen: A mediated moderation model." *Acta Psychol Sin 46(2014):1521–1533*.
- De, Bruyn A and Lilien GL. "A multi-stage model of word of mouth influence through viral marketing." *Int J Res Mark 25(2008):151–163*.
- Sherry, P, Schneider KL, Martinus E and Molly W, et al. "Tweeting it off: Characteristics of adults who tweet about a weight loss attempt." *J Am Med Informatics Assoc Jamia 6(2014):1032*.
- Motrico, E, Conejo CS and Martin GC. "Effectiveness of web-based and mobile-based psychological interventions to prevent perinatal depression: Study protocol for a systematic review and meta-analysis of randomized controlled trials." *Internet Interv 26(2021):100471*.
- Gan, C. "Understanding WeChat users' liking behavior: An empirical study in China." *Comput Human Behav 68(2017):30–39*.
- Li, Y, Sallam MH and Ye Y. "The impact of WeChat use intensity and addiction on academic performance." *Soc Behav Personal an Int J 47(2019):1–7*.
- Zhang, T, Xu L and Tang Y. "Using 'WeChat' online social networking in a real-world needs analysis of family members of youths at clinical high risk of psychosis." *Aust New Zeal J Psychiatry 52(2018):375–382*.
- Lyu, KX, Zhao J, Wang B and Xiong G, et al. "Smartphone application WeChat for clinical follow-up of discharged patients with head and neck tumors." *Chin Med J Engl 129(2016):2816–2823*.
- Li, X, Xu ZR, Tang N and Cui Y, et al. "Effect of intervention using a messaging app on compliance and duration of treatment in orthodontic patients." *Clin Oral Investig 20(2016):1849–1859*.
- Kerpershoek, L, De Vugt M and Wolfs C. "Erratum to: Access to timely formal dementia care in Europe: Protocol of the Actifcare (Access to timely formal care) study." *BMC Health Serv Res 16(2016):620*.
- Zhang, T, Li H, Woodberry KA and Larry S, et al. "Interaction of social role functioning and coping in people with recent-onset attenuated psychotic symptoms: A case study of three Chinese women at clinical high risk for psychosis." *Neuropsychiatr Dis Treat 11(2015):1647*.
- A, Mark and B. Hannah. "Antidepressants in use in clinical practice." *Psychiatr Danub 29(2017):667–671*.
- Cipriani, A, Zhou X, Del Giovane C and Sarah EH, et al. "Comparative efficacy and tolerability of antidepressants for major depressive disorder in children and adolescents: A network meta-analysis." *Lancet 388(2016):881–890*.
- Carreno, FR and Frazer A. "Vagal nerve stimulation for treatment-resistant depression." *Neurotherapeutics 14(2017):716–727*.
- Levinstein, MR and Samuels BA. "Mechanisms underlying the antidepressant response and treatment resistance." *Front Behav Neurosci 8(2014):208*.
- Cuijpers, P, Van SA and Andersson G. "Internet-administered cognitive behavior therapy for health problems: a systematic review." *J Behav Med 31(2008):169–177*.
- Ciarrochi, J, Robb H and Godsell C. "Letting a little nonverbal air into the room: Insights from acceptance and commitment therapy Part 1: Philosophical and theoretical underpinnings." *J Ration Cogn Ther 23(2005):79–106*.
- Tai, S and Turkington D. "The Evolution of Cognitive Behavior Therapy for Schizophrenia: Current Practice and Recent Developments." *Schizophr Bull 35(2009):865–873*.
- Wang, L, Li Q and Xu Y. "Research progress of physical therapy for depression. World Latest Medical Information Digest." *Med Dig 28(2018):4*.
- Cristancho, P, Cristancho MA, Baltuch GH and Michael ET, et al. "Effectiveness and safety of vagus nerve stimulation for severe treatment-resistant major depression in clinical practice after FDA approval." *J Clin Psychiatry 72(2011):1376–1382*.
- Olin, B, Berry S, Broglio and Amara J. "A patient-level meta-analysis of studies evaluating vagus nerve stimulation therapy for treatment-resistant depression." *Med Devices Evid Res 6(2013):17*.
- Bajbouj, M, Merkl A, Schlaepfer TE and Astrid Z, et al. "Two-year outcome of vagus nerve stimulation in treatment-resistant depression." *J Clin Psychopharmacol 30(2010): 273–281*.
- Hayes, SC, Pistorello J and Levin ME. "Acceptance and commitment therapy as a unified model of behavior change." *Couns Psychol 40(2012):976–1002*.
- Hayes, SC. "Acceptance and commitment therapy, relational frame theory, and the third wave of behavioral and cognitive therapies – republished article." *Behav Ther 47(2016):869–885*.
- Jessica, MC. "A review of 'act made simple: An easy-to-read primer on acceptance and commitment therapy.'" *J Couple Relatsh Ther 13(2014):264–265*.
- Twohig, MP and Levin ME. "Acceptance and commitment therapy as a treatment for anxiety and depression." *Psychiatr Clin North Am 40(2017):751–770*.
- H, YU and Wang Q. "B/S framework based network element access method, involves transmitting connection request to network element based on Telnet or SSH data package, and accessing network element based on B/S framework."
- Li, P. "WeChat applet promotion strategies of small shops." in 2020 International conference on E-commerce and internet technology (ECIT)." *Int Conf E-Commerce Internet Technol 56(2020): 273–276*.

37. Morris, ME and Aguilera A. "Mobile, social, and wearable computing and the evolution of psychological practice." *Prof Psychol Res Pract* 43(2012): 622–626.
38. Olf, M. "Mobile mental health: A challenging research agenda." *Eur J Psychotraumatol* 6(2015):27882.
39. Luxton, DD, McCann RA, Bush NE and Mishkind M, et al. "mHealth for mental health: Integrating smartphone technology in behavioral health care." *Prof Psychol Res Pract* 42(2011):505–512.

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