

Analysis of Depression and Working Memory Effectiveness of 'Active Health Mini Program'

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Abstract: Parents of special children will encounter many difficulties and pressures in the process of raising special children, which will cause discomfort in mental health, such as depression. Depression is usually accompanied by cognitive decline, and its working memory will be damaged. The existing tools are cumbersome for the test of depression and working memory capacity. For general hospitals, rapid and convenient diagnosis of patients' depression and working memory is of great practical significance for doctors to make treatment plans. Therefore, this experiment first tested the applicability of Zung self rating depression scale (SDS) in parents of special children, and simplified the SDS on this basis. Secondly, the effectiveness of depression and working memory tasks in active health mini-programs will be investigated. In this experiment, 125 parents were recruited. (1) The internal consistency coefficient of SDS was 0.83; (2) Split-half reliability, Spearman-Brown correction coefficient was 0.72; (3) Factor analysis, According to the Ksiser method, five factors were obtained by the criterion of eigenvalue ≥ 1 , the characteristic roots were 5.38, 3.07, 1.72, 1.12 and 1.01, respectively, which explained 22.59%, 15.82%, 8.05%, 7.83% and 7.18% of the variation values, and the cumulative contribution rate was 61.47%, Four factors were obtained by reclassifying the factors with too few variables; (4) There was a significant positive correlation between the small program depression score and the SDS, $r = 0.42$, $P < 0.001$; (5) There was a significant positive correlation between small program working memory name and memory color, $r = 0.25$, $P < 0.05$; (6) There was a significant positive correlation between the correct number of small program memory items and the position 1 of Bcak corsi knock task (BCT), $r = 0.49$, $P < 0.01$; (7) There was a significant negative correlation between the correct number of small program memory items and the position 2 of BCT, $r = -0.56$, $P < 0.01$; (8) There was a significant positive correlation between the two memory positions of BCT, $r = -0.81$, $P < 0.01$. The results showed that although it did not fully reflect the patient's overall depression or working memory status, the self-assessment of depression and working memory in the small program can reflect the patient's depression and cognitive impairment. It is an effective and simple tool.

Keywords: Depression, Working Memory, Parents of Special Children

1. Introduction

Special children are collectively referred to as children with special needs, that is, disabled children with physical or psychological development defects, including children with intellectual, visual, auditory, physical, verbal, emotional and other developmental disorders, physical disabilities, multiple disabilities, etc. [1]. According to official survey data, there are more than 3.87 million special children aged 0-14 in China. Due to the inconvenience of special children, they also have great dependence on their parents, and need more

psychological and life care than normal children. For families, it is also necessary for parents of special children to pay more time and experience to care for and care for special children. Parents will also take care of special children for a long time. The sense of responsibility given by the role of parents will also affect their psychological state. They not only need to worry about the self-care situation and disease prevention of children with diseases, but also need to take more pressure on the education of special children than parents of normal children. Under the influence of multiple factors, the emotional health of parents of special children will also be affected. If there is no reasonable way to regulate and relieve,

it will further develop into depressive symptoms.

Depression is a common mental disorder, which is characterized by cognitive impairment, affective disorder and behavioral disorder. It often shows symptoms such as depression and slow thinking. In China, the incidence of depression among adults is also high, and the incidence of depression in men and women is 16.7% and 19.5%, respectively. 10% -15% of individuals with depression are accompanied by suicidal tendencies. It can be seen that depression is more common in the general population and is also an important mental health problem that needs the attention of the whole society [2].

As parents of special children, they will encounter many difficulties and pressures in the process of raising special children, and they will also feel more pressure. Excessive life pressure and responsibility will make parents of special children have more negative emotional experience and less happiness [3], and will also cause mental health discomfort [4]. If the mental health of the parents of special children is not taken seriously and not effectively treated and adjusted, it will also affect the negative development of their parent-child relationship, which will further lead to more psychological and behavioral problems for special children. [5]. Not only special children are socially vulnerable groups, special children's parents are also one of the socially vulnerable groups [6].

The existing research pays more attention to the parental pressure of parents of special children, and considers helping parents of special children to reduce parental pressure and improve the parenting pressure of parents of special children, so as to better cope with the complex social environment. Research in this area also shows that effective external social support can improve parenting stress. However, the development of affairs is affected by both internal and external factors. Compared with external factors, the internal factors of parents of special children are more important. Compared with external factors, internal factors are more stable and persistent, which is of great significance to the upbringing and growth of special children and the external environmental resilience of parents of special children. Due to the long-term social discrimination faced by parents of special children and the pressure and burden caused by children's congenital defects, their mental health problems, especially emotional health problems, cannot be ignored.

1.1. Research Status of Cognitive Function of Parents of Special Children

Persistent low mood is the main clinical feature of depression, usually accompanied by cognitive decline, suicidal ideation, sleep disorders and other symptoms (American Psychiatric Association, 2013). Changes in cognitive function are not only a typical symptom of depression, but also an important factor in depressive episodes [8-11]. Depressed patients usually acquire and process too much negative information in the cognitive process, and form negative cognitive concepts about themselves, daily life and future, which eventually leads to persistent low mood and depression. Joormann believes that the cognitive control

deficit of working memory content is related to the negative bias processing of depression patients. The processing of negative information in working memory makes it difficult for patients to actively adopt adaptive emotion regulation strategies [12]. Studies have shown that verbal working memory and visual spatial memory in patients with depression are impaired [13, 14]. Brain imaging studies have also shown that patients with depression have different priority processing of positive information in working memory compared with normal individuals [15, 16]. Depressive patients lack positive priority effects [7, 12, 17].

1.2. Research Significance

From the perspective of content, the family of special children mainly includes special children and their parents. In the past, research often focused on special children and the influence of parents on special children. In recent years, the mental health of parents of special children has gradually attracted attention, but there are still few studies on depression and the content is relatively simple. Depression must also affect cognition, making parents pay more attention to things around them and make more rational decisions. Therefore, understanding the relationship between depression, decision-making ability and working memory capacity of parents of special children can help rehabilitation therapists, doctors and researchers to understand the growth process of special children beyond their own symptoms, which is of great significance for the rehabilitation of special children, the return of parents and families of special children to normal.

1.3. Research Purposes

The existing tools for testing depression and working memory capacity are cumbersome, and usually require professionals to guide the subjects in specific venues. For general hospitals, rapid and convenient diagnosis of patients' depression and working memory is of great practical significance for doctors to make treatment plans. Therefore, this experiment will first test the applicability of Zung's self-rating depression scale (SDS) in parents of children with special needs, and on this basis, simplify the SDS, and test the depression degree of patients through the active health small program, and investigate the relationship between the two. Secondly, depression has a certain degree of damage to cognitive function. The active health program combines the Back corsi knock task (BCT), and can quickly know the degree of cognitive impairment of the patient. Therefore, the second purpose of this experiment will examine the effectiveness of active health programs.

2. Methods and Material

2.1. Information

A total of 125 parents of special children in the rehabilitation department of the First Affiliated Hospital of Jinan University were recruited to fill out the 'Active Health Mini Program' rehabilitation question + psychological question, basic information questionnaire, SDS and BCT

(about 40min-1h, can be carried out in two times).

The topic of "Active Health Mini Program" was adapted, tested and determined by professors and doctors of the First Clinical Medical College of Jinan University and the School of Management according to the existing cognitive

neuropsychological topics. After more than 1,000 copies of the scan code filling, the participants' understanding of the subject, the operability of the small program form and the availability of the background data were stable. The example of 'Active Health Mini Program' is shown in Figure 1.

The figure displays four examples of the 'Active Health Mini Program' interface. Each example consists of a question card, a response area, and navigation buttons.

- Example 1 (Top Left):** Question 17: "Please rate your depression in the past six months (1-7 points, the more depressed the higher the score)." Response area: Radio buttons A 1, B 2, C 3, D 4, E 5, F 6, G 7. Buttons: Confirmation, Previous question.
- Example 2 (Top Middle):** Question 18: "In the past half year, I felt that I had no motivation to do anything (1-7 points, the less motivation the higher the score)." Response area: Radio buttons A 1, B 2, C 3, D 4, E 5, F 6, G 7. Buttons: Confirmation, Previous question.
- Example 3 (Top Right):** Question 19: "I've been feeling down in the last half year (1-7 points, the lower the mood, the higher the score)." Response area: Radio buttons A 1, B 2, C 3, D 4, E 5, F 6, G 7. Buttons: Confirmation, Previous question.
- Example 4 (Bottom Left):** Question 16: "Next, a chart will be presented. Please remember and its position, and answer the question." Response area: A 4x4 grid of icons (paperclip, triangle, cloud, star, microscope, guitar, diamond). A timer shows "3秒". Buttons: Confirmation, Previous question.
- Example 5 (Bottom Middle):** Question 16: "Please indicate where there are figures in the table." Response area: An empty 4x4 grid. Buttons: Confirmation, Previous question.
- Example 6 (Bottom Right):** Question 16: "Please enter the name of the graph in the table." Response area: An empty 4x4 grid. A button "Click to fill in" is in the bottom right cell. Buttons: Confirmation, Previous question.
- Example 7 (Bottom Far Right):** Question 16: "Please enter the color of the graph in the table." Response area: An empty 4x4 grid. A button "Click to fill in" is in the bottom right cell. Buttons: Confirmation, Previous question.

Figure 1. The example of 'Active Health Mini Program'.

2.2. SDS

There are many scales to measure depression, such as Hamilton Depression Scale (HAMD), SDS [18] and so on. Among these scales, SDS is widely used in different fields

such as psychological counseling and treatment, medical clinic and psychiatric diagnosis in China due to its advantages of high reliability and validity, simple operation and easy mastery. It is also an important method for rapid screening of patients with depression in general hospitals or psychological

counseling clinics.

SDS developed the scale in 1965 to screen for potential depressive disorders in adults. It included 20 items, including 2 items of mental affective symptoms, 8 items of somatic disorders, 2 items of psychomotor disorders and 8 items of depressive psychological disorders. Each item was composed of 7 grades. The scale is simple to use and can directly reflect the subjective feelings of depressed patients, which is suitable for adults with depressive symptoms.

Although the scale is widely used, some people have different opinions on the appropriateness and correct use of scores. The original score of the scale is between 20-80, and Zung suggests converting the original score into an exponential score (range 25-100) by multiplying 1.25. It is recommended that adults be identified as depression with a critical index score of 50 and above, but many researchers wrongly apply the original score of 50 as a critical point. Therefore, many researchers have discussed this contradiction. Wenxian believes that the SDS index score of 53 is more suitable for the Chinese population, while other researchers believe that the index score of 55 is more suitable for Australians. According to the results of Chinese norm, the cut-off value of SDS standard score was 53 points, of which 53-62 points were mild depression, 63-72 points were moderate depression, and 73 points were severe depression. At present, the related research on SDS shows that the correlation coefficients of the 20 items of the scale are > 0.7 . The test-retest reliability of each item was $0.730 \sim 1.000$, and the Cronbach 'sa coefficient was $0.782 \sim 0.784113$ ' 14.

2.3. BCT

BCT is a classic visual working memory span task with good reliability and validity. This task requires participants to store and reproduce a series of block locations. Nine 30mm x 30mm separation blocks are displayed on a 15.6-inch white computer screen. In the formal task, a series of identical blue-filled circles appeared, and the stimulation interval of each circle was 1 second. Participants must remember the square where the circle appears, and must use the wireless mouse to click on the square on the computer screen, pointing out the position in the opposite order (that is, starting from the square where the last circle appears and ending with the square where the first circle appears). They have an obligation to click on the correct number of squares, even guessing is necessary. Participants were asked to complete the task as

accurately and quickly as possible. Once responding, self-correction is not allowed. The span of two to seven circles increases in turn. In each sequence, there were five trials with the same span length, and the number of correct clicks on the cube was greater than or equal to 3 times as an indicator of the visual working memory span. The difficulty range is 2-7, and each difficulty level error is twice the ability difficulty. We collect difficulty span (2-7), difficulty total score (difficulty span * total number of trials = 0-300), and position accuracy. The example of BCT is shown in Figure 2. The task collected complete data from 59 subjects.

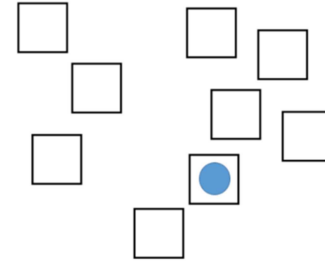


Figure 2. The example of BCT.

2.4. Statistical Methods

The reliability of SDS was evaluated by internal consistency reliability and split-half reliability. The structural validity of the scale was evaluated by factor analysis. Data analysis was performed using SPSS 24.0. At the same time, we also analyzed the reliability and validity of BCT. The internal consistency reliability was used to evaluate the reliability, and the factor analysis method was used to evaluate its validity. Pearson correlation analysis was performed on the SDS and the self-rating depression score in the active health program, and Pearson correlation analysis was performed on the applicability of BCT of the active health program.

3. Results

3.1. Reliability and Validity Analysis of SDS

Of the 125 subjects, 78.4% had no depression, 17.8% had mild depression, 2.4% had moderate depression, and 2.4% had severe depression. The average standard score of SDS was 45.1 ± 10.75 . The average standard score of each item is shown in Table 1.

Table 1. The average score and standard deviation.

	M	sd		M	sd
Depressed mood	1.59	0.60	Confusion	2.06	0.96
Diurnal variation	2.50	1.09	Retardation	2.06	1.01
Crying spells	1.40	0.75	Agitation	1.55	0.63
Lack of sleep	1.86	0.89	Hopelessness	1.78	0.94
Loss of appetite	1.87	1.13	Irritability	2.05	0.85
Loss of sex drive	2.44	1.17	Indecisiveness	2.35	0.95
Weight loss	1.22	0.53	Suicidal rumination	1.78	0.87
Constipation	1.36	0.71	Emptiness	2.03	0.96
Tachycardia	1.27	0.68	Personal devaluation	1.19	0.52
Fatigue	1.82	0.82	Dissatisfaction	1.77	0.96

Reliability analysis: Table 2, the correlation analysis results of SDS items and total scale can be seen that there is a significant correlation between each item and the total scale, $P < 0.05$, indicating that the direction of each item and the total scale is consistent, and the scale structure is better. The

reliability analysis of SDS showed that the internal consistency coefficient of the scale was 0.83.

The split-half reliability test of the scale showed that the Spearman-Brown correction coefficient was 0.72, which indicated that the split-half reliability of SDS was high.

Table 2. Correlation coefficient matrix of SDS items and total scale.

	Depressed mood	Diurnal variation	Crying spells	Lack of sleep	Loss of appetite	Loss of sex drive	Weight loss
Diurnal variation	0.08						
Crying spells	.406**	-0.04					
Lack of sleep	.322**	-0.02	.315**				
Loss of appetite	0.05	.228*	.192*	-.238**			
Loss of sex drive	.246**	.216*	.209*	0.09	.493**		
Weight loss	-0.08	-.259**	0.08	0.08	-0.04	0.03	
Constipation	0.11	-0.07	0.17	.316**	-0.1	0.08	.197*
Tachycardia	0.13	-.297**	.486**	.273**	-0.15	-0.07	.261**
Fatigue	.462**	0.01	.420**	.324**	-0.07	0.12	0.12
Confusion	0.14	-0.02	.196*	0.01	.385**	.305**	-0.06
Retardation	0.02	0.11	0.08	-0.07	.517**	.438**	0.02
Agitation	.538**	0.08	.503**	.255**	.198*	0.16	0.09
Hopelessness	.191*	0.02	.287**	0.06	.414**	.374**	0.11
Irritability	.431**	0.04	.472**	.360**	0.01	0.07	-0.01
Indecisiveness	.234**	.256**	.205*	-0.01	.420**	.395**	0
Suicidal rumination	0.15	0.93	0	0.7	0	0	0.79
Emptiness	.386**	.190*	.331**	0.15	.347**	.536**	-0.04
Personal devaluation	.347**	0.07	.289**	.246**	0.04	.202*	-0.06
Dissatisfaction	.289**	0.1	.326**	0.04	.423**	.375**	0
SDS fraction	.500**	.228*	.586**	.298**	.534**	.636**	0.09

	Constipation	Tachycardia	Fatigue	Confusion	Retardation	Agitation	Hopelessness
Diurnal variation							
Crying spells							
Lack of sleep							
Loss of appetite							
Loss of sex drive							
Weight loss							
Constipation							
Tachycardia	.230**						
Fatigue	.229*	.403**					
Confusion	0.01	0.06	.291**				
Retardation	-0.14	-0.01	0.04	.553**			
Agitation	.209*	.223*	.488**	.283**	.255**		
Hopelessness	0	0.03	.194*	.434**	.342**	.248**	
Irritability	-0.01	.266**	.381**	0.08	0	.340**	0.02
Indecisiveness	0.03	-0.04	.210*	.518**	.571**	.325**	.420**
Suicidal rumination	0.81	0.28	0.09	.557**	.498**	.224*	.680**
Emptiness	-0.01	-0.02	.303**	.317**	.364**	.370**	.502**
Personal devaluation	-0.01	0.01	.228*	0.11	0.08	.354**	0.12
Dissatisfaction	0.03	0.13	.348**	.501**	.448**	.442**	.610**
SDS fraction	.184*	.233**	.521**	.613**	.579**	.617**	.646**

	Irritability	Indecisiveness	Suicidal rumination	Emptiness	Personal devaluation	Dissatisfaction
Diurnal variation						
Crying spells						
Lack of sleep						
Loss of appetite						
Loss of sex drive						
Weight loss						
Constipation						
Tachycardia						
Fatigue						
Confusion						
Retardation						
Agitation						

	Irritability	Indecisiveness	Suicidal rumination	Emptiness	Personal devaluation	Dissatisfaction
Hopelessness						
Irritability						
Indecisiveness	0.02					
Suicidal rumination	-0.04	.522**				
Emptiness	0.16	.437**	.495**			
Personal devaluation	.230**	0.07		.380**		
Dissatisfaction	0.12	.567**	.583**	.530**	.179*	
SDS fraction	.359**	.671**	.647**	.705**	.352**	.739**

3.2. Factor Analysis

In this study, the SDS results of 124 subjects were tested by KMO and Bartlett. The KMO result was 0.802, and the Bartlett test $P < 0.001$, that is, the scale is suitable for factor analysis. The principal component analysis of the advanced behavior rotation, the root Ksiser method, and the criterion of eigenvalue ≥ 1 obtained five factors.

The characteristic roots were 5.38, 3.07, 1.72, 1.12, and 1.01, respectively, explaining 22.59%, 15.82%, 8.05%, 7.83%, and 7.18% of the variation values, respectively. The cumulative contribution rate is 61.47%. After 7 times of initial load proof rotation transformation, 5 factors were obtained. According to the size of the factor load and the significance of the variables and the principle that the number of variables per factor is not less than 3, it is finally classified into 4 factors. The items contained in each factor were analyzed and summarized. Combined with the specific situation of the sample, we obtained that factor 1 included loss of appetite, loss of sexual interest, difficulty in thinking, loss of ability, despair, difficulty in decision, sense of uselessness, sense of emptiness in life and loss of interest. Factor 2 includes depression, crying, sleep disorders, palpitations, fatigue, not easy to irritate; factor 3 includes life emptiness and worthlessness; factor 4 includes morning heavy night light, constipation and weight loss.

Table 3. Rotated component matrix.

	1	2	3	4	5
Depressed mood		0.65	0.33	0.19	
Diurnal variation	0.11			0.82	
Crying spells	0.22	0.69	0.13	-0.20	
Lack of sleep	-0.19	0.44	0.37		0.39
Loss of appetite	0.70			0.26	
Loss of sex drive	0.54		0.37	0.30	0.22
Weight loss				-0.39	0.56
Constipation		0.18			0.83
Tachycardia		0.52	-0.22	-0.54	0.25
Fatigue	0.14	0.70			0.22
Confusion	0.72	0.21			
Retardation	0.75		-0.11	0.11	
Agitation	0.29	0.66	0.13		0.15
Hopelessness	0.69		0.36	-0.22	
Irritability		0.76			-0.18
Indecisiveness	0.73	0.13		0.26	0.10
Suicidal rumination	0.78		0.23	-0.23	
Emptiness	0.52	0.18	0.63	0.12	
Personal devaluation		0.30	0.71		-0.13
Dissatisfaction	0.73	0.26	0.17		

3.3. Correlation Analysis of Mini Program Depression Score and SDS

Since the active health program takes a self-assessment of the degree of personal depression based on the SDS scale, it is a convenient online tool with only three questions. Therefore, we will complete the correlation analysis between the subjects of the active health program and the scores of the SDD to determine the practical effect of the tool. Pearson correlation analysis showed that mini program depression score was positively correlated with SDS score, $r = 0.42$, $P < 0.001$. This result shows that the self-rating depression scale and the SDS have a good effect on individual depression assessment. Pearson correlation analysis results are shown in table 4.

Table 4. Correlation analysis between mini program depression score and SDS.

	mini program depression score	SDS score
mini program depression score	1.00	.416**
SDS score	.416**	1.00
	0.00	

3.4. Mini Program Working Memory Analysis

There was a significant positive correlation between memory name and memory color, $r = 0.25$, $P < 0.05$. The results are shown in Table 5.

Table 5. Correlation analysis between the dimensions of working memory.

	Position	Name	Color
Position			
Name	0.18		
Color	0.22	0.25*	
Digital	-0.10	-0.02	0.23

The correlation analysis of BCT working memory items showed that there was a significant positive correlation between the correct number of memory items and position 1, $r = 0.49$, $P < 0.01$, and a significant negative correlation between the correct number of memory items and position 2, $r = -0.56$, $P < 0.01$. There was a significant positive correlation between the two memory locations, $r = -0.81$, $P < 0.01$.

Table 6. Correlation analysis between the dimensions of mini program BCT.

	Accurate number	Position 1
Accurate number		
Position 1	0.49**	
Position 2	-0.56**	-0.81**

* At 0.01 (two-tailed), significant correlation.

4. Conclusion

This experiment first tested the reliability and validity of the Zung 's self-rating depression scale (SDS) in parents of special children. On this basis, we focused on the application analysis of depression and working memory related content in the self-developed active health mini program.

SDS has been widely used at home and abroad. Its reliability and validity have been well proved [19-21]. The results of reliability and validity analysis of SDS in tables 1 to 3 showed that the scale had good reliability and validity and was suitable for parents of special children. In this study, five factors were obtained after factor analysis. Using factor analysis to evaluate the construct validity of the scale is a recognized method. Reviewing the literature, the conclusions of SDS three-factor and four-factor models are more common [19, 22-24]. In this study, two factors with too few variables were classified into other factors, and four factors were finally obtained, with a cumulative contribution rate of 61.47 %. Both factor 1 and factor 2 contain psychological symptoms and somatic symptoms, which are the same as the results of Wang Wenjing 's study [19]. In addition, the psychological symptoms in factor 2 are not classified in factors 1 and 3, which are mainly somatic symptoms. It is believed that irritability may be a more characteristic somatic symptom of depression. Irritability is a typical symptom of anxiety disorder (including psychomotor agitation, irritability, and sleep disturbances), which may be caused by the combined effects of family environment and social environment of children with special conditions [25]. The family structure of special children has changed: the 5number of single-parent families has increased, the stability of family structure has decreased, and the divorce rate and remarriage rate have increased; in addition, the social support system is not perfect. Compared with ordinary parents, parents of special children encounter more difficulties in the process of child rearing. Therefore, parents of all kinds of special children generally have greater psychological pressure and significant anxiety.

The self-assessment of depression in the active health program is based on the SDS. The correlation analysis between depression score of Active Health Mini Program and SDS score showed that there was a significant positive correlation between the two. This means that when the score of active health program depression is higher, the score of SDS is also higher. The results show that the self-assessment of depression in patients with depression in the active health program can quickly measure and reflect the depression status of patients, and has a good effect on individual depression assessment. Although the active health mini program has fewer questions and loses the multi-dimensional evaluation of depression, the active health mini program characterized by convenience and effectiveness has certain applicability to measure the degree of depression in patients with depression.

The reverse corsi tapping task is a classic visual working memory span task with good reliability and validity. Using the results of the working memory test in the active health program, it was found that there was a significant correlation between the

memory name and the memory color, which means that the parents of special children have a correlation between the memory name and the memory color in the working memory, and the name memory is better. This may be related to the individual 's attention processing process. Attention, as the gatekeeper of working memory, guides and regulates the individual 's attention processing process [9, 26]. In addition, when designing the picture color of the applet, we did not choose the typical color of the picture, that is, the consistency between the picture and the color is low, and the consistency between the picture and the color significantly affects the color naming and working memory. When the picture is inconsistent with the color, the performance may be reduced [27]. The results are consistent Wenfei Wang [28] and Haiyan Liu [29]. This result also shows that working memory can measure the working memory status of patients with depression in the active health program.

This study mainly explores the effectiveness of self-rating depression and working memory assessment in the active health mini-program. It was found that although it does not fully reflect the patient 's overall depression or working memory status, the self-rating depression and working memory in the mini-program can reflect the patient 's depression and cognitive impairment. It is an effective and simple tool.

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