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# The Effects of Behavioral Activation on the Mental Health and Behavioral Habits of Depressed and Anxious Students in Colleges and Universities

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**Abstract** The builders and practitioners of the next thirty years, the creators of the completion of the Chinese dream, and the achievers of the hundred-year change. As the talent reserve and the future pillar, the health condition of college students is related to the future and destiny of the Party and the country. An important foundation of talent quality, and the improvement of mental health literacy is more the improvement of talent quality in the new era. It is a critical period for college students to improve their ideological and moral quality as well as to shape and set their behavioral habits. During this period, it is not only a meaningful but also an urgent matter to emphasize the formation of behavioral habits and the formation of qualities. As we all know, the outward behavioral habits are an important symbol of whether a person has developed good ideology and morality, and also an important symbol of the success of educational activities. Therefore, college students' mental health and behavioral habit formation education become the central theme of this paper. Behavior activation has the characteristics of simplicity, efficiency and easy dissemination, and there are a few applications in China, but there is a lack of theoretical research on behavior activation therapy. The purpose of this study was to (1) revise the Chinese version of the short version of the Behavior Activation Scale for depression, an important assessment tool in the study of behavior activation treatment, and examine its reliability; (2) examine the effect of behavior activation in improving depression through intervention studies and explore the mechanism of the role of reinforcement sensitivity and coping style in behavior activation intervention. The experimental results show that the best algorithm can study depression, anxiety, stress, analyze depression, anxiety, stress and its influencing factors, and help students explore mental health. Objectively, to accurately identify the risk factors that cause depression, anxiety and stress of college students, and take preventive measures.

**Index Terms** behavioral activation, depression and anxiety, mental health, machine learning

## I. Introduction

What society needs most is a positive person. Being positive is an attitude and a way of life, which allows people to change from passive to active, overcome negativity and slackness, and live with confidence and vitality in the face of complicated social phenomena [1]. Modern society is full of rapid changes, increasingly fierce competition, and a variety of complex ideas and thoughts. At the same time, in the turbulent world situation, China is in a critical period of transformation from the old social system to the new one, where opportunities and challenges coexist, and people have their own unique and stable views in the face of success and failure. During the university period, which is the primary transition period in life, college students have gradually matured physiologically, but not fully matured psychologically. Such a special group certainly has a lot of psychological confusion and a negative and unscientific tendency in attributing

success and failure to them. Contemporary college students' behaviors such as suicide, injury and destruction often become the focus of media attention, which are the bad results caused by the bad attribution of college students [2].

However, it is certain that the lack of standardization and cultivation of behavioral habits is an important reason for the ineffective. In the author's opinion, the education of college students' behavioral habits is the education that educators combine the behavioral norms required by the state and society with the behavioral norms specifically for college students, combine theory and practice, through repeated behavioral training, and combine a variety of educational methods, purposely, systematically and organizationally exert influence on college students, so that they can form good and stable behavioral habits, and then promote their ability to practice sound ideology and morality. The psychological health of college students has been widely concerned by the society. It is not

uncommon to see students' psychological problems, mental problems, and even unnatural deaths due to various reasons on university campuses [3]. They may cause serious impact on the safety and stability of universities, and some of them even disturb the normal order of study, life and work of schools. According to the World Health Organization, 16.0%-25.4% of college students in China have some degree of psychological problems [4].

Behavioral activation is a structured, short-course psychotherapeutic approach that centers while reducing avoidance and withdrawal behaviors to help visitors control from the activities and engage in a more positive state of life. Also, a study in a survey of some college students found that college students' depression. Some studies have also found that college students' depression and anxiety levels are significantly higher than the national adult model [5]. To help them solve the psychological problems they encounter in their psychological development and to help them develop comprehensively, fully, harmoniously and actively is an important issue for higher education institutions to build a harmonious campus. As an important constituent group of society, which should attract wide attention and focus of the whole society.

The rapid development of the social and economic system, college students have undergone great changes in both the number and the scale structure [6]. The behaviors and lifestyles of college students during their school years can not only affect their health in adulthood, but even in their whole life, and college students are still in their adolescence, and their emotions are more likely to fluctuate in the process of growth compared with adults, so college students in school are prone to many psychological problems, and these psychological problems can produce many potential dangers, and to solve these problems is to ensure the health of college students and make The prerequisite for their better development [7].

In conclusion, studying the specific paths affecting the cultivation of college students' mental health can help promote the quality of talent cultivation in colleges and universities. In-depth understanding of the laws of college students' behavioral habits and the ways and means of mental health cultivation can help improve college students' mental health literacy, effectively reduce school instability, reduce depression and anxiety, and improve the effectiveness of student education and talent cultivation [8], [9].

## II. Machine Learning Algorithm Optimization

Machine learning is the process of using computers to imitate human learning behaviors, accumulating new knowledge and experience in the process of learning, and building their own knowledge structure based on this knowledge [10], so as to improve their own learning ability. Through computers learning the laws and patterns of data in a large amount of data, it is necessary to analyze the goal of the problem to choose the applicable type of machine learning. Pearson correlation coefficient is an appropriate method to explore the linear relationship between continuous variables [11].

$$\rho(X, Y) = \frac{\text{cov}(X, Y)}{\sigma_X \sigma_Y} = \frac{\sum_{i=1}^n (X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum_{i=1}^n (X_i - \bar{X})^2} \sqrt{\sum_{i=1}^n (Y_i - \bar{Y})^2}}. \quad (1)$$

The Spear correlation coefficient is calculated as follows:

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}. \quad (2)$$

The width of the branches between nodes depends on the weight information, while the curve shape of the branches is controlled using third-order Bessel curves, which are calculated accordingly as follows.

$$B_3(t) = (1-t)^3 P_0 + 3t(1-t)^2 P_1 + 3t^2(1-t) P_2 + t^3 P_3, \quad (3)$$

for all  $t \in [0, 1]$ .

The trajectory of the final point is the resulting Bessel curve.

$$\begin{aligned} \frac{|P_0 P_0'|}{|P_0 P_1|} &= \frac{|P_1 P_1'|}{|P_1 P_2|} \\ &= \frac{|P_2 P_2'|}{|P_2 P_3|} \\ &= \frac{|P_0' P_0''|}{|P_0' P_1'|} \\ &= \frac{|P_1' P_1''|}{|P_1' P_2'|} \\ &= \frac{|P_0'' P|}{|P_0'' P_1''|} = t, \quad t \in [0, 1]. \end{aligned} \quad (4)$$

The information entropy is calculated as shown in Eq. (5):

$$\text{Entropy}(D) = - \sum_{i=1}^m p_i \log_2 p_i. \quad (5)$$

The information gain of the sample set  $D$  is calculated.

$$\text{Gain}(D, a) = \text{Entropy}(D) - \sum_{v=1}^V \frac{|D^v|}{|D|} \text{Entropy}(D^v). \quad (6)$$

Specify that the reduced-dimensional sample is a centralized sample, so  $\sum_{i=1}^m z_i = 0$ , it is easy to know  $\sum_{i=1}^m t_{ij} = \sum_{j=1}^m t_{ij} = 0$ , then it can be deduced that:

$$\sum_{i=1}^m d_{ij}^2 = \text{tr}(T) + m t_{jj}. \quad (7)$$

$$\sum_{j=1}^m d_{ij}^2 = \text{tr}(T) + m t_{ii}. \quad (8)$$

Type	Features	Representative Scales
Dedicated to students	Designed to meet the physical characteristics of students	Mental Health Scale for Secondary School Students MSSMHS; Mental Health Diagnostic Test for Primary and Secondary School Students MHT; University Student Personality Inventory UPI
No specific status restrictions	Wide range of application, as long as the age of the test subject meets the requirements	Symptom Self-Measurement Scale SCL90
Measures specific psychological symptoms	Specialized in measuring the severity of symptoms of certain psychological disorders	Depression Self-Rating Scale SDS

Table 1: Classification of mental health scales

$$\sum_{i=1}^m \sum_{j=1}^m d_{ij}^2 = 2m * \text{tr}(T). \tag{9}$$

Further set:

$$d_{i.}^2 = \frac{1}{m} \sum_{j=1}^m d_{ij}^2. \tag{10}$$

$$d_{.j}^2 = \frac{1}{m} \sum_{i=1}^m d_{ij}^2. \tag{11}$$

$$d_{..}^2 = \frac{1}{m^2} \sum_{i=1}^m \sum_{j=1}^m d_{ij}^2. \tag{12}$$

It is ultimately known that

$$t_{ij} = -\frac{1}{2} (d_{ij}^2 - d_{i.}^2 - d_{.j}^2 + d_{..}^2). \tag{13}$$

### III. Methods

It is the education to cultivate good behaviors of college students and make them form good and stable personal habits through a series of behavioral training under the guidance of morality and behavioral norms, and further promote the good moral quality of individuals under the role of moral practice of good behavioral habits. Independent samples t-test and control groups to analyze the effects of behavioral activation intervention on individual behavioral activation level, depression level, coping style and reinforcement sensitivity.

Correlation and regression analyses between variables were conducted on all 77 questionnaire data to explore the mediating and moderating effects of coping style and reinforcement sensitivity in the process of behavioral activation levels affecting depression. The various psychological scales have different objects, contents, and cultural applicability and are used to detect the mental status of different types of groups, which can be broadly classified according to Table 1.

Mental health maturity of college students is more influenced by social environment and social life practices. Because of the closed learning and living environment, school education environment and school life environment are important influencing factors. [12] summarize the characteristics of college students' psychological development as:

- 1) rapid increase in intellectual level but one-sided thinking;
- 2) growing emotional richness but not stability;
- 3) significant increase in self-awareness but less mature development;
- 4) strong desire for interaction but easy to show psychological closedness;

5) development of sexual awareness but easy to show psychosexual imbalance.

Second, because psychological questionnaire data are mostly hierarchical in structure, when identifying groups with poor psychological status, psychologists need to compare the statistical results of each group from different questionnaire perspectives and frequently perform manual operations such as group grouping, data slicing, and score statistics. Figure 1 depicts an example of the operational process for analyzing the effect of gender and whether one child is an only child on students' mental health when using traditional software.

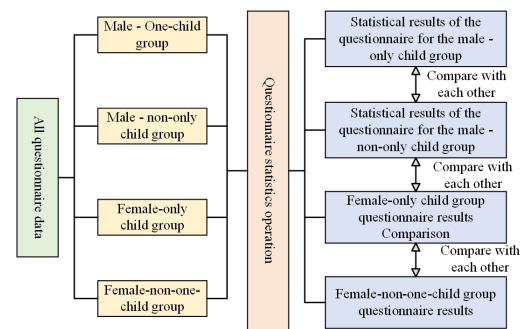


Figure 1: Effect of gender and only-child status

Mental health problems refer to "psychological factors or psychological states that affect the effectiveness of an individual's normal behavior and activities". The psychological problems of college students are mainly manifested as life adaptation problems, learning problems, interpersonal problems, self-development problems, career planning problems, stress and emotional problems, psychosexual problems, and other psychological problems, such as cyber psychological problems. In this paper, they are divided into developmental psychological problems and obstructive psychological problems [13]. Developmental psychological problems include learning, emotion, interpersonal relationship, personal growth and psychological crisis. Disordered psychological problems include problems such as cognitive disorders, emotional disorders, behavioral abnormalities and severely impaired social functioning. Information visualization aims to deal with abstract, unstructured data collections, using visual views to discover hidden information and patterns in the data [14]. The information visualization reference model improves the pipelined linear model into a continuous loop structure by allowing the user to interact with different processing stages in the model, as shown in Figure 2.

To verify the effect of the BA intervention on the level of individual behavioral activation, the differences between the BADS-SF scores measured before and after the experimental

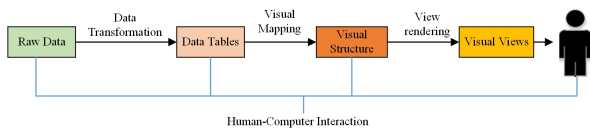


Figure 2: Reference model for visualization of depression and anxiety information

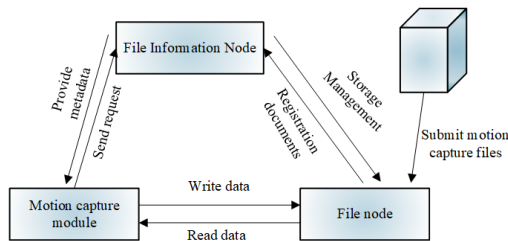


Figure 3: Optimization of structural model of depression and anxiety

and control groups were compared. Using the measurement time as the horizontal coordinate and the total score and each dimension score of the BADS-SF scale and control groups as the vertical coordinates, a line graph was plotted, and it can be seen that at the pre-test, the AC dimension score and the total BADS-SF score, and at the post-test, the AC dimension and the BADS -SF total scores were almost unchanged, while the AC dimension. In contrast, the AV dimension scores of the two groups were very close and did not change significantly in both pre- and post-measures [15]

Depression measurement instruments can be divided into two main types, a scale that measures depressed mood and a scale that measures behavioral symptoms of depression. The most widely used depression scales developed to date are the Hamilton Depression Inventory, the Depression Self-Rating Inventory, and the Beck Depression Inventory [16]. We can see through the structural model, i.e., the model of causality among latent variables, in which the latent variables that are exogenous are called extrinsic latent variables (or extrapolated latent variables). The exogenous latent variables may be influenced by other variables when explaining the endogenous latent variables, and these influencing variables are the interfering latent variables, see Figure 3.

Few studies have explored the relationship between coping styles and behavioral activation, but based on the theoretical model and operationalization of BA, it can be assumed that coping styles have an important role in BA treatment. The study of anxiety is a major area of interest for psychologists. [17] have proposed that anxiety is an unpleasant state of fear and uneasiness in individuals, while containing somatic activation of efforts and expectations to escape from danger and threat, but essentially powerless against them, and further defined anxiety as an emotional experience caused by internal and external sources of stimuli that threaten the self-esteem of individuals, accompanied by psychological states such as uneasiness, fear, apprehension, and dread [18].

Variables	Observed variables	Unobserved variables	Exogenous variables	Endogenous variables
28	11	17	14	14

Table 2: Descriptive statistics of depression and anxiety

	Weights	Covariances	Variances	Means	Intercepts	Total
Fixed	13	0	6	0	0	19
Labeled	0	0	0	0	0	0
Unlabeled	18	10	8	0	0	36
Total	31	10	14	0	0	55

Table 3: Depression model parameter classes

#### IV. Results

In order to grasp the essence of the education of college students' behavioral habits, we must firmly grasp the two key points of behavioral norms and behavioral habits, and put the focus on cultivating good behavioral habits of the educated according to the correct behavioral norms. Therefore, in subsequent BA interventions or studies, attention should be paid to emphasize the importance of behavioral avoidance and behavioral activation respectively, and increase the content of activities related to behavioral avoidance. In addition, after the end of BA interventions, the change of behavioral activation and behavioral avoidance of individuals over a longer period of time should be tracked to better understand the process of BA interventions [19].

The number of variables in the two models is 28, the number of observed variables is there are 11, the number of non-observed variables is 17, and both exogenous and endogenous variables are 14, as shown in Table 2.

In the depression model parameter class table, there are 13 fixed parameters included. The number of regression coefficient parameters is 31. The results are shown in Table 3.

In the table of anxiety model parameters, the number of fixed parameters is 10, the number of regression coefficient parameters is 29, the number of fixed parameters is 10, the results are shown in Table 4.

The process of machine learning is generally divided into two stages. In the first stage, the training samples are inputted into the strategic thought of educating people with "moral education" as the central link. It is true that, as Sukhomlinsky said, "without psychological cultivation, physical, moral and aesthetic cultivation is impossible to imagine." Therefore, it is important to clarify the importance of psychological development of "five education" and analyze the inner logical relationship between them to recognize. In the second stage, we input test samples to test the generalization ability of the model, as shown in Figure 4.

In addition to the basic characteristics of general education, such as standardization and practice, the education of contemporary college students' behavioral habits has considerable

	Weights	Covariances	Variances	Means	Intercepts	Total
Fixed	10	0	9	0	0	19
Labeled	0	0	0	0	0	0
Unlabeled	19	5	5	0	0	29
Total	29	5	14	0	0	48

Table 4: Anxiety parameters



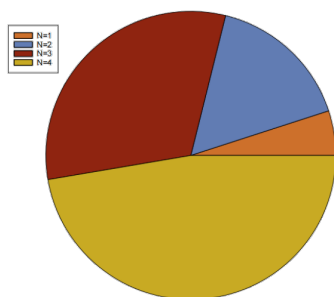


Figure 4: Proportion of each psychological state

special characteristics, combined with the characteristics of today's time, and specifically for the development of behavioral habits. In terms of depression, the results of Liu Meng et al.'s survey of 734 college students in a university in Gansu showed that the incidence of depression was significantly higher in men than in women, and the possibility of depression in college men was 1.377 times higher than that in women, and among females emotions not only affect their psychological condition, but also have an impact on their physical condition, and emotionally comfortable female Menstrual disorders were significantly lower among college women with good mood than those with depression [20].

The results of a survey and analysis of 1982 undergraduate students in 15 universities in China showed that male students had higher positive anxiety detection rates and positive stress detection rates compared to female students. This may be due to our traditional belief that male students are under more pressure than female students in terms of family and society, and because there is a big difference in the way different genders react when facing psychological problems and emergencies, while male students become silent when facing psychological problems, female students are more emotional and are more willing to confide and express than male students. In terms of academic performance, there are statistical differences between college students' academic performance in terms of depression, anxiety and stress [2].

## V. Conclusion

The study was the first to revise the Chinese version of an important assessment tool for behavior activation treatment, and demonstrated that the DS-SF can be used as a tool to assess the level of behavior activation in the Chinese population. The education of college students' behavioral habits helps them to establish a good moral image and improve their moral practice ability before they fully enter the society, which not only promotes the overall development of people, but also delivers a batch of high-quality talents to the country and society. In the aspect of college students themselves, college students are basically adults who have reached the age of 18, and should have certain self-control and cognitive ability, and when they have negative emotions, they should have certain action measures to improve their current state,

such as participating in outdoor activities, or reading books that inspire the mind, so that they can face the difficulties they face with a positive attitude and have the courage to overcome them.

## References

- [1] Chilcot, J., Picariello, F., & Farrington, K. (2022). Depression and clinical outcomes in CKD: do anti-depressants play a role?(EQUAL study). *Clinical Kidney Journal*, 15(8), 1628-1629.
- [2] Treharne, G. J. (2020). Appropriate depression questionnaires may be useful in the correct clinical setting. *BMJ*, 322(7283), 406-409.
- [3] Dorfman, R., London, Z., Metias, M., Kabakchiev, B., Mukerjee, G., & Moser, A. (2020). Individualized medication management in ontario long-term care clinical impact on management of depression, pain, and dementia. *Journal of the American Medical Directors Association* (6), 21.
- [4] Mew, E. J., Monsour, A., Saeed, L., Santos, L., Patel, S., Courtney, D. B., ... & Butcher, N. J. (2020). Systematic scoping review identifies heterogeneity in outcomes measured in adolescent depression clinical trials. *Journal of Clinical Epidemiology*, 126, 71-79.
- [5] Zugliani, M. M., Fidry, M., Steffen, R. E., Lan, K., Brietzke, E., Milev, R., ... & Freire, R. C. (2021). Clinical effectiveness of non-TMS neurostimulation in depression: Clinical trials from 2010 to 2020. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, 110, 110287.
- [6] Bradson, M. L., Riegler, K. E., Thomas, G. A., & Arnett, P. A. (2022). A-12 Physical Activity Attenuates the Effect of Pain on Depression Symptoms in Multiple Sclerosis. *Archives of Clinical Neuropsychology*, 37(6), 1247-1247.
- [7] Bettis, A. H., Forehand, R., Sterba, S. K., Preacher, K. J., & Compas, B. E. (2018). Anxiety and depression in children of depressed parents: Dynamics of change in a preventive intervention. *Journal of Clinical Child & Adolescent Psychology*, 47(4), 581-594.
- [8] Hga, D., Lt, A., Car, A., Ihg, B., & Lmwa, C. (2021). Coping strategies, neural structure, and depression and anxiety during the covid-19 pandemic: a longitudinal study in a naturalistic sample spanning clinical diagnoses and subclinical symptoms. *Biological Psychiatry Global Open Science*, 1(4), 261-271.
- [9] Kalmbach, D. A., Cheng, P., Roth, A., Roth, T., Swanson, L. M., O'Brien, L. M., ... & Drake, C. L. (2022). DSM-5 insomnia disorder in pregnancy: associations with depression, suicidal ideation, and cognitive and somatic arousal, and identifying clinical cutoffs for detection. *Sleep Advances*, 3(1), zpac006.
- [10] Shivaprakash, N., & Modi, T. (2021, February). Psychotic and Anxiety Disorders Presenting With Cannabis Use in California. In *Journal of Investigative Medicine* (Vol. 69, No. 2, Pp. 543-543). British Med Assoc House, Tavistock Square, London Wc1h 9jr, England: Bmj Publishing Group.
- [11] Anderson, H., & Daly, S. (2019). Are gabapentin-related medications effective in reducing anxiety symptoms in adults with anxiety disorders?. *Evidence-Based Practice*, 22(10), 18-19.
- [12] Alexandra, B., Olivier, D., Thomas, B., & Bruno, A. (2020). Current pathological classification of anxiety disorders. *La Revue Du Praticien*, 69(9), 970-973.
- [13] Bruno, A., Alexandra, B., Olivier, D., & Thomas, B. (2020). A brief description of the common relationship between major depressive disorder, anxiety disorders and anxiety symptoms. *La Revue du praticien*, 69(9), 974-975.
- [14] Jingchun Zhou, Boshen Li, Dehuan Zhang, Jieyu Yuan, Weishi Zhang, Zhanchuan Cai. "UGIF-Net: An Efficient Fully Guided Information Flow Network for Underwater Image Enhancement," *IEEE Transactions on Geoscience and Remote Sensing*, vol. 61, 4206117.
- [15] Ali, J., Shan, G., Gul, N., & Roh, B. H. (2023). An Intelligent Blockchain-based Secure Link Failure Recovery Framework for Software-defined Internet-of-Things. *Journal of Grid Computing*, 21(4), 57.
- [16] Ali, J., Jhaveri, R. H., Alswailim, M., & Roh, B. H. (2023). ESCALB: An effective slave controller allocation-based load balancing scheme for multi-domain SDN-enabled-IoT networks. *Journal of King Saud University-Computer and Information Sciences*, 35(6), 101566.
- [17] Dong, Q., & Liu, X. Optimization Practice of University Innovation and Entrepreneurship Education Based on the Perspective of OBE. *Journal of Combinatorial Mathematics and Combinatorial Computing*, 118, 181-189.
- [18] Liao, Q. English Teaching Project Quality Evaluation Based on Deep Decision-Making and Rule Association Analysis. *Journal of Combinatorial Mathematics and Combinatorial Computing*, 118, 119-127.

- [19] Xu, J. Optimizing English Education in the Information Era: A Multimodal Approach Based on BOPPPS Teaching Model. *Journal of Combinatorial Mathematics and Combinatorial Computing*, 118, 33-48.
- [20] Ning, X. Evaluation of Individual Innovation and Entrepreneurship Effect Based on Linear Space Model and Grey Correlation. *Journal of Combinatorial Mathematics and Combinatorial Computing*, 118, 3-17.

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