Advances in Artificial Intelligence and Machine Learning; Research 3 (4) 1758-1767 Received 20-10-2023; Accepted 21-12-2023; Published 28-12-2023

Feasibility Study on Assessing Emotional Health: Applications of Artificial Intelligence

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Abstract

Numerous studies indicate that educators often experience high levels of stress. Reducing stress and anxiety can prevent setbacks in their professional realization, thereby improving teaching quality and maintaining physical and mental health. Educators must adapt to the constant changes in today's society to ensure the comprehensive development of student populations. However, continuous interaction with students, parents, or legal guardians, as well as relationships with peers, can lead to the accumulation of stress and tension. Over time, this can result in symptoms of burnout syndrome. Therefore, considering students' right to education and the requisite quality of education, educators should pay special attention to and maintain emotional well-being. This study utilizes artificial intelligence technology to obtain signals of organ cell function from the human body. Through database matching, the current status of organ function is determined. Subsequently, a comparison is made with questionnaire data to confirm the psychophysical condition of each case. A total of 20 cases were collected for this study, and through comprehensive analysis of the results from artificial intelligence detection and emotional health self-assessment questionnaires, the feasibility of assessing emotional health through artificial intelligence detection was confirmed. The analysis revealed a high degree of correlation between the two models. Therefore, the results of this study can serve as a reference for relevant professionals in academia, industry, and government.

Citation: Wen-Fu Yang, et al. Feasibility Study on Assessing Emotional Health: Applications of Artificial Intelligence. Advances in Artificial Intelligence and Machine Learning. 2023;3(4):101.

Keywords: Artificial Intelligence (AI), Big data, Educators, Emotional health, Stress.

1. INTRODUCTION

In this generation, educators face various challenges and job demands daily. The nature of their work requires a high level of emotional investment [1]. When these demands exceed the personal and organizational resources available to educators, it can easily trigger symptoms and illnesses related to anxiety, depression, and stress. If multiple symptoms occur simultaneously, it is referred to as burnout syndrome [2]. Burnout syndrome comprises three characteristic symptoms: (1) Emotional fatigue; (2) Depersonalization; (3) Low personal accomplishment [3]. Extensive surveys have found a close relationship between burnout and various psychological disorders, especially teacher depression, anxiety, and stress [4]. Therefore, considering the long-term impact of work place environments and job demands on educators, it can be anticipated that their physical health will be significantly influencing, elevating the risk of illness due to emotional stress. Regarding the levels of stress, anxiety, and depression, current research indicates a high proportion of teachers exhibiting adverse psychological symptoms. Therefore, we must recognize the severity of teachers experiencing emotional stress and urgently take measures to meet the needs of the entire education sector and protect their mental health [5]. Because artificial intelligence can achieve early warning and alerting, tracking and prediction, diagnosis and prognosis, treatment and healing, as well as social control [6]. Therefore, this study aims to establish a feasible emotional health stress analysis and early warning system through artificial intelligence technology and big data analysis. This system would enable educators to quickly and easily understand their physical condition and make adjustments, reduce the probability of triggering emotional stress-related illnesses, and minimize harm to their bodies. This study proposes two hypotheses:

H1: assumes a positive correlation between hypertension and stress levels among educators.

H2: assumes a positive correlation between the vascular Dysfunction and stress levels among educators.

2. LITERATURE REVIEW

Artificial Intelligence (AI) is the general term for the science of artificial intelligence. It utilizes computer simulations of human intelligent behavior, training computers to learn behaviors such as learning, judgment, and decision-making [7]. Artificial intelligence opens up new applications in education, marketing, healthcare, finance, and manufacturing, impacting productivity and performance [8]. The origins of artificial intelligence date back to 1956 and are described as the science and engineering of creating intelligent machines applicable to a wide range of areas in the medical field, including medical diagnostics [9]. The ability to apply model-based assessment of routine diagnostic features in pathology, as well as to extract and identify new features to gain a deeper understanding of disease, has shown significant progress in the application of machine learning methods in pathology [10].

However, there are more and more cases where people still feel unwell even if biochemical test data and physical examination results are normal. This shows that the absence of illness does not mean that the body is in a healthy state [11]. Artificial intelligence detection techniques used in preventive medicine rely on important indicators obtained through the analysis of human biological signals. Electrodes are one of the most crucial technologies for extracting biological signals [12]. Therefore, the application of artificial intelligence analysis in healthcare, such as medical management, predictive medicine, clinical decision-making, and diagnosis, has become very mature [13]. By using artificial intelligence as an extension of the hospital healthcare system, the burden on staff and other healthcare professionals can be reduced [14].

Modern medical symptom interpretation has reached a fairly mature stage through the computational analysis of big data. In the healthcare field, we can access massive amounts of data and use data statistics and analysis techniques to assist in processing this information, providing valuable insights for both doctors and patients [15]. Comparing and analyzing large amounts of biochemical and instrument testing data with big data databases through artificial intelligence computing analysis has become a major trend in the development of the medical industry [16]. Currently, studies have employed artificial intelligence to detect emotional stress, such as assessing the function of the Autonomic Nervous System (ANS) through artificial intelligence devices like Heart Rate Variability (HRV). HRV measurements indeed provide an objective method for evaluating emotional stress [17]. Leveraging artificial intelligence-assisted data analysis to predict mental health disorders among healthcare workers during the current pandemic is particularly crucial, especially since they are at risk of contracting COVID-19 [18]. Therefore, the application of big data and artificial intelligence technology has changed the way healthcare is delivered globally [19].

This study uses cross-analysis of artificial intelligence device detection data and emotional health self-assessment questionnaires to understand the emotional stress of each case. Our goal is to use technological methods to detect the development trend of disease symptoms early and make adjustments as soon as possible to reduce the incidence of the disease. This can improve people's quality of life and reduce the government's medical burden.

3. RESEARCH METHODOLOGY

This research adopts case study method. Currently, the assessment of educators' emotional health mainly relies on various subjective emotional stress measurement scales [1]. There is currently no study of application of artificial intelligence equipment for objective information collection. This study employed a convenience sampling method and invited 30 participants based on the researchers' work environments. This study will conduct a comparative analysis between artificial intelligence detection data and self-assessment questionnaires on emotional health, evaluating the feasibility of using artificial intelligence to assess the emotional health risks of educators.

3.1 Research Subjects

This study selected 30 educators as research subjects. Due to the need to coordinate with participants' availability, select suitable venues for testing and data collection through interviews, and

considering environmental limitations for instrument use, as well as factors related to data collection and analysis time, the entire process took approximately five months. Due to incomplete data or the inability to complete the data acquisition process, upon reviewing relevant information, only data from 20 participants with complete information were available for analysis. The research subjects are educators at the university level, including both teaching faculty and staff members. Seeking treatment for emotional stress is considered a matter of personal privacy. However, because medication may cause AI detection values to normalize, participants were asked to indicate whether they were taking medication for control TABLE 1.

Table 1: Research Subject Data

No	Gender/Age/ Medication	No	Gender/Age/ Medication	No	Gender/Age/ Medication
1	Female/55/No	8	Female/27/No	15	Female/64/Yes
2	Male/65/Yes	9	Male/49/No	16	Male/38/No
3	Male/51/Yes	10	Male/56/Yes	17	Female/35/No
4	Female/62/Yes	11	Male/46/No	18	Male/60/Yes
5	Female/71/Yes	12	Male/33/No	19	Male/58/Yes
6	Female/58/No	13	Female/55/No	20	Male/35/No
7	Male/36/No	14	Male/42/No		

3.2 Research Tools

3.2.1 Artificial intelligence application devices

Through the detection and evaluation of risk factors for disease occurrence, scientific health management is conducted to assist individuals in targeted interventions before the formation of diseases, ultimately achieving health maintenance [20]. This forms the core of preventive medicine development. Establishing a comprehensive health service system involves disease screening, early diagnosis, health management, treatment, and prognosis assessment for patients, aiding physicians in monitoring the health status of individuals [21]. Long-term monitoring of health-related information helps establish a scientific health management system. This facilitates effective interaction between patients and medical institutions, enabling early disease prevention and reducing national health insurance expenditures [22]. Therefore, the effective use of artificial intelligence technology in the development and application of preventive medicine is considered to be a key factor in reducing the incidence of disease and reducing the government's medical burden [12]. Using wearable devices to collect various information about human emotional states, including physical information, location information, and social network information. Through the analysis of human big data, human emotions are obtained, and diverse feedback is used to influence human emotions [23]. The artificial intelligence device used in this study requires the input of participant data to obtain comparative data. Subsequently, it utilizes transmitters to emit and receivers to measure the frequency intensity and time differences corresponding to organ cells. After collecting individual case data, a cross-analysis is performed by comparing the data with the database, and risk items are then identified. In the initial stages of device development, traditional Chinese medicine pulse diagnosis theory was employed to understand that different organs in the human body have independent frequencies

for detecting and judging various diseases and symptom development states. Therefore, through the development of artificial intelligence technology for detecting the functions of human organ cells, a large-scale collection of case detection information for different diseases and symptoms was conducted, comparing it with hospital test results to build a big data matching database. The device is positioned as a preventive medical testing and consulting tool that is non-invasive, does not require fasting, and utilizes artificial intelligence detection technology and computational analysis of big data matching programs to rapidly acquire risk data for preventive adjustments. This device has received validation as a testing device from the European Union.

3.2.2 Emotional health self-assessment questionnaire

This questionnaire consists of a total of 12 questions and is based on the content of the Stress Index Measurement Table from the Health Promotion Administration, Ministry of Health and Welfare, Taiwan [24]. Participants are asked to self-assess their current feelings of stress, emotional reactions, and the sources of stress. Chronic stress is one of the main factors contributing to physical illnesses. Understanding an individual's emotional health index not only allows for the quicker and more accurate identification of the root causes of diseases but also facilitates providing appropriate adjustments.

3.3 Research Procedure

Inviting thirty research participants, scheduling time and space, to undergo artificial intelligence testing and self-assessment questionnaire testing for emotional health. Please refer to FIGURE 1, for the research process.

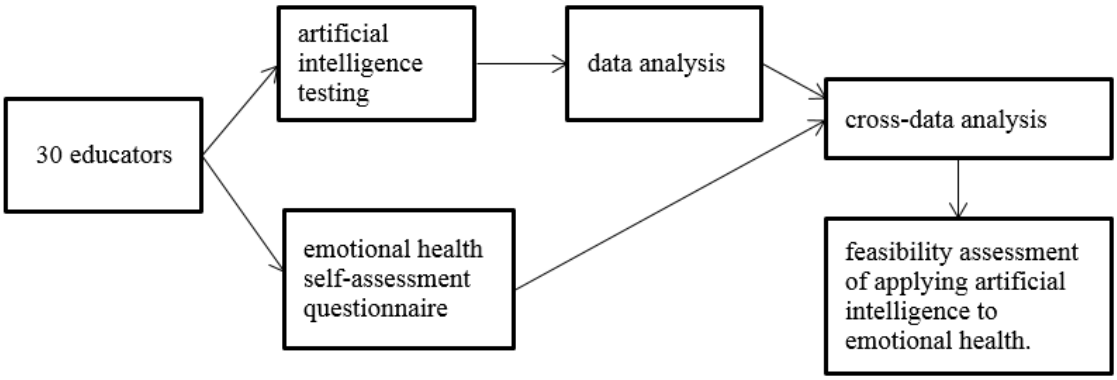

Figure 1: Research Process

3.4 Explanation of Data Interpretation Criteria

The set testing items in this study have indicators for each item that provide explanations for the risk of developing emotional health issues. The criteria for determination are as follows:

3.4.1 Artificial intelligence devices

Among the risk factors for cardiovascular diseases, hypertension is the most strongly associated, and the probability of developing it is very high [25]. Psychological inferences of stress, including increased levels of anxiety, depression, or anger, are known predictors of hypertension [26]. Preliminary studies and systematic reviews have consistently shown that clinically significant symptoms of anxiety, depression, and perceived stress are often associated with hypertension, with anxiety and depression being the most common mental disorders in hypertensive patients [27]. Cardiovascular (CV) risk factors such as hypercholesterolemia, hyperglycemia, obesity, hypertension, smoking, and aging contribute to vascular inflammation and endothelial activation [28]. Stress is an unavoidable part of life. Chronic stress due to adversity, depression, anxiety, or loneliness/social isolation may harm human health [29]. Therefore, when the test results are compared with classifications in the big data database, if factors related to hypertension are present and the data is lower than 0.425, a risk alert will be issued. For example, terms such as "hypertension" and "vascular dysfunction (inflammation of blood vessels or atherosclerosis)" may represent an increased likelihood of chronic emotional stress-related disorders. The evaluation criteria are shown in TABLE 2.

Table 2: Explanation of Test Data

Number	**< 0.225**	**0.225 0.425**	**0.425 1.000**	**> 1.000**
Meaning	High-risk(3)	Moderate-risk(2)	Low-risk(1)	No risk at present(0)

3.4.2 Emotional health self-assessment questionnaire (Stress index measurement)

The cumulative scientific evidence linking stress to negative health outcomes is substantial. Stress can directly impact health through the autonomic nervous system and neuroendocrine responses, and it can also indirectly affect health through changes in health behaviors [30]. This study adopts the content of the Stress Index Measurement Table from the Health Promotion Administration, Ministry of Health and Welfare, Taiwan, for design. Please refer to TABLE 3, for assessment criteria.

4. RESEARCH RESULTS

This study utilizes two methods, artificial intelligence devices, and emotional health self-assessment questionnaires. Referencing the design principles of the devices and the theoretical foundations of the questionnaires, interpretations and analyses are conducted based on the detection data and questionnaire scores. The results of cross-referencing can be found in the comprehensive analysis table (TABLE 4).

The artificial intelligence detection is configured with two items, hypertension and vascular dysfunction (inflammation), as the basis for risk warning assessment. According to the statistics, in this study, a total of 8 cases taking medication were interviewed subsequently. Cases 2, 4, 10, and 18, among others, did not adhere to the doctor's prescription for daily medication control for hypertension, resulting in high-risk values for both hypertension and vascular dysfunction. Another case, number 4, self-reported high demand, scored 0 on the emotional health self-assessment ques-

Table 3: Emotional Health Self-Assessment Questionnaire (Stress Index Measurement)

The total number of 'Yes' responses	Representing Meaning	Risk Value (Represented by Number)
3	Your stress index is still within a manageable range.	No risk at present (0)
4 5	Stress is bothering you, and although you can manage it reluctantly, it is necessary to seriously learn stress management. Additionally, consider discussing with mentors and friends.	Low-risk (1)
6 8	Your stress is significant; consider promptly seeking a mental health professional for systematic psychological therapy.	Moderate-risk (2)
9 12	Your stress is severe; consider consulting a psychiatrist, following their prescription for medication, and undergoing psychological therapy to help restore your life to a normal track promptly.	High-risk (3)

tionnaire, indicating no self-perceived stress. However, during the interview, significant emotional fluctuations were evident, and with a history of hypertension and poor medication control, there was a disparity between the self-assessment questionnaire and the actual condition. For cases 8, 16, and 17, three cases had consistent results between artificial intelligence detection and the questionnaire. Through interviews, it was found that besides being in the young and middle-aged range with good self-regulation mechanisms for physical functions, their attitudes and mindset towards stress were positive. They were willing to accept challenges and failures, making mindset a key factor in regulating emotional stress.

5. CONCLUSION

Using artificial intelligence applications to assess the feasibility of emotional health, the analysis and comparison of data from two detection tools, namely artificial intelligence devices and emotional health self-assessment questionnaires, resulted in 6 cases achieving a 100% match, accounting for 30%. There were 9 cases with a 50% match, accounting for 45%. In 5 cases, the comparison results did not match, representing 25%. If the comparison is based on conditions where both assessment tools issue risk warnings, the feasibility of risk warning increases to 75%. Therefore, H1 and H2 of this study are supported. This result suggests the feasibility of utilizing artificial intelligence applications for assessing emotional health and proposing risk alert methods. Furthermore, through subsequent case interviews, it was found that self-administered questionnaires are susceptible to individual cognitive factors, environment, and emotional factors at the time, leading to distorted self-assessment results. Chronic stress can be adaptive, meaning that prolonged stress may cause self-awareness to be neglected, resulting in a lack of perceived stress but continued harm to the body. Substantial evidence indicates that experiences of chronic stress are associated with various life-threatening diseases, including cardiovascular diseases, insulin insensitivity, and cancer [31]. Relying solely on self-assessment questionnaires for evaluating and discussing emotional stress

Table 4: Comprehensive Analysis Table

No	Age/ Gender/ Medication: Yes/No	Emotional Health Risk Alert			Comparison of results between the two tests (Criteria for judgment: Remarks)
		Artificial Intelligence Detection		Emotional Health Self-Assessment Questionnaire	
		Hypertension	Vascular Dysfunction		
1	55/F/ No	2	1	2	50%
2	65/M/ Yes	3	3	3	100%
3	51/M/ Yes	1	2	1	50%
4	62/F/ Yes	2	2	0	0%
5	71/F/ Yes	1	2	1	50%
6	58/F/ No	2	1	2	50%
7	36/M/ No	0	1	0	50%
8	27/F/ No	0	0	0	100%
9	49/M/ No	2	2	2	100%
10	56/M/ Yes	2	3	2	50%
11	46/M/ No	1	1	2	0%
12	33/M/ No	0	1	1	50%
13	55/F/ No	1	1	1	100%
14	42/M/ No	0	1	2	0%
15	64/F/ Yes	0	2	1	0%
16	38/M/ No	0	0	0	100%
17	35/F/ No	0	0	0	100%
18	60/M/ Yes	2	3	2	50%
19	58/M/ Yes	1	2	1	50%
20	35/M/ No	0	0	1	0%

Remarks:
1. The AI test results are consistent with the questionnaire, 100% matching.
2. One item in the AI detection is consistent with the questionnaire, which is a 50% match.
3. The AI detection results are inconsistent with the questionnaire, and there is a 0% match.

states may be insufficient to truly understand the internal and authentic condition of the individual, especially in Eastern cultures. Utilizing artificial intelligence applications for discussing emotional stress analysis based on scientific data can help individuals clarify the true sources of internal stress. This approach enables a quicker and more effective adjustment of the body's condition to restore genuine physical, mental, and spiritual balance. Therefore, incorporating this model as one of the annual health check items for educators would aid in early preventive adjustments, reducing the risk of illness.

6. RESEARCH LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

Education is a century-long national project, and educators are the implementers of this plan. The modern educational environment is challenging and faces diverse pressures. The emotional well-being care for educators is relatively crucial for the nation. Considering factors such as the use of

artificial intelligence devices, detection environments, professional analysts, and feasible coordination with individual case timelines, a case study method was adopted for this study project. It is suggested that future research directions could involve large-scale data collection and verification supported by government project resources. The expectation is that the application of artificial intelligence can improve and reduce the harm and threats of emotional stress-related diseases to humanity.

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