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ARTICLE

The Influence of Internet Use on Women's Depression and Its Countermeasures—Empirical Analysis Based on Data from CFPS

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ABSTRACT

Based on China Family Panel Studies (CFPS) 2018 data, the multiple linear regression model is used to analyze the effects of Internet use on women's depression, and to test the robustness of the regression results. At the same time, the effects of Internet use on mental health of women with different residence, age, marital status and physical health status are analyzed. Then, we can obtain that Internet use has a significant promoting effect on women's mental health, while the degree of Internet use has a significant inhibitory effect on women's mental health. In addition, the study found that women's age, education, place of residence, marital status, length of sleep, working status and physical health status are the main factors affecting the mental health of Chinese women. In the heterogeneity investigation of residence, age, marital status and physical health status, Internet use has a greater negative impact on the Center for Epidemiological Studies Depression Scale (CES-D8) scores of women in rural areas, has a significant positive impact on the mental health of middle-aged and elderly women or women with spouses, and has a positive impact on the mental health of physically unhealthy women. Therefore, in view of women's mental health needs and the problems existing in the use of the Internet, this paper puts forward some suggestions to further improve the overall mental health level of women.

KEYWORDS

Internet use; depression; multiple linear regression; heterogeneity

Introduction

Since the 1990s, the Internet in China has begun to flourish, especially after 2000, with the rise of domestic e-commerce, social software and other Internet fields. The Chinese Internet has received widespread attention all over the world. According to the statistics of the China Internet Network Information Center [1], as of June 2023, the number of Internet users in China had reached 1.079 billion, and the Internet penetration rate reached 76.4%. Furthermore, the average online time reached 29.1 hours per week. The rapid development of the Internet has not only affected the social and economic life, but also changed people's ideas and way of life. The popularity of the Internet has not only brought great changes to people's lives, but also brought a profound impact on people themselves.

People gradually showed some signs of pathological behaviors in the process of using the Internet, such as Internet dependence, Internet abuse and so on, which also brought serious negative consequences on people's emotions, such as loneliness [2], depression and so on.

In today's global society, the psychological pressure on human beings is increasing day by day, and emotional disorder has gradually become the main psychological problem troubling human beings. As a result, depression has become the second largest disability disease in the world. On the evening of July 05, 2023, the famous singer Coco Lee committed suicide due to depression and died at the age of 48. The sudden news not only shocked, but also brought the word “depression” back to the public perspective. According to the survey of mental health in China, there are 95 million people suffering from depression in China. Depression among school adolescents is more serious as well as the prevalence rate of women, about twice as high as that of men. About 280,000 people commit suicide in China every year, of which about 40% suffer from depression. Especially after the COVID-19 epidemic, the cases of severe depression and anxiety disorders increased by 28% and 26%, respectively.

With the development of society, people pay more and more attention to women not only in the traditional sense of marriage and family, education and employment, but also in social security, physical and mental health and other aspects that directly reflect women’s quality of life. Women’s mental health [3] has become the focus of common attention at home and abroad. Under this background, this paper considers the female samples from the Chinese household tracking survey database as the research object to explore the influence mechanism of Internet use on people suffering from depression. This paper puts forward some suggestions for improving the mental health level of Chinese women, alleviating depression and improving the quality of life.

Literature Review

Current research status

In recent years, many scholars have studied the problem of mental health. Zhai et al. [4] have found that the Internet usage rate of the elderly in China is low, and the use of the Internet can help reduce the risk of depression in the elderly. Through the interview, Zhu [5] found that the Internet has become an important way for urban young women to get emotional support and social support after delivery. Yang et al. [6] studied the depression of middle-aged and elderly women in rural areas of China, and found that their depression was more serious, and called on the government to pay attention to the psychological status of rural middle-aged and elderly women. Yang et al. [7] investigated the mental health status of middle-aged and elderly women and concluded that the mental health status of middle-aged and elderly women is worthy of attention, and is closely related to marital status, education level and health status. Gui et al. [8] analyzed the depression symptoms of widows in rural areas of Sichuan Province and concluded that depression symptoms seriously affected the health of widows, especially those who lived alone. Zhao et al. [9] studied the relationship between social activity participation and depression among urban female widows and found that the widows had a higher degree of depression than those who have a spouse, and there was no significant difference in the degree of social activity participation among the widows of different genders. Using CHARLS data, Bai [10] found that labor participation had a negative impact on depressive symptoms in the elderly, that is, compared with non-labor participants, the elderly engaged in labor participation had a lower level of depressive symptoms. Pan et al. [11] investigated the mental health status of college students under the COVID-19 epidemic as a stress factor and found that 502 (12.6%) college students may have depressive symptoms, and 1,066 (26.8%) college students definitely have depressive symptoms.

The relationship between internet and depression

People in modern society have been inseparable from the Internet, and the Internet has become an indispensable part of people’s life [12–14]. The proper use of the Internet can bring joy to people, and ease the pressure encountered in life, so as to reduce the emergence of depression. But for Internet addicts, they are immersed on the Internet for a long time, which causes them to ignore the communication in real life [15]. The gap between the virtual world and the real world will make them feel lost and feel unable to integrate into real life, which leads to depression. The relationship between Internet addiction [16] and depression is not a one-way relationship. In fact, they are interdependent. When Internet users use the Internet for a long time, it will lead to physical weakness [17], mental exhaustion, and then lead to depression; while patients with depression seek Internet escape from reality, they will become lonelier and more lost, thus aggravating the degree of depression and further aggravating the problem of Internet addiction.

Selection and Treatment of Variables

Data source

The data of this paper are selected from the China Family Panel Studies [18] (CFPS) in 2018, conducted by the China Social Science Research Center of Peking University, which aims to reflect the changes of China’s society, economy, population, education and health [19] by tracking and collecting data at the individual, family and community levels. CFPS uses computer-aided investigation technology to conduct visits, which provides a data basis for academic research and public policy analysis and ensures data quality.

The sample data in 2018 covered 31 provinces/municipalities/autonomous regions in China. According to the research purpose of this paper, this paper excluded the data of “refusing to answer”, “not applicable” and “do not know”, and finally contains 7,670 valid samples.

Dependent variable: degree of depression

The CFPS database used eight simplified questions from the Center for Epidemiological Studies Depression Scale (CES-D8) [20] to test individual depression, of which six are negative, including the following: “I feel depressed”, “I find it hard to do anything”, “I don’t sleep well”, “I feel lonely”, “I feel sad” and “I feel like life can’t go on”. Two positive questions are included as follows: “I feel happy” and “I live a happy life”. The answer options for these questions are treated as follows: almost none [18] (less than one day) is set to 1, sometimes (1–2 days) is set to 2, often (3–4 days) is set to 3, and most of the time (5–7 days) is set to 4.

In this paper, the positive question is first transformed into the score of the negative question [21], that is, the reverse score, and then the scores are summarized to calculate the final score. The higher the score is, the more serious the depression is. Depression symptoms are classified [22] as follows, based on scores: CES-D8 ≥ 20 shows depressive symptoms, CES-D8 < 20 shows no depressive symptoms. In addition, the initial CES-D8 score is standardized to obtain a comprehensive indicator of mental health status, represented by StdCES-D8.

Independent variable: internet use

In this paper, the use of the Internet [23] refers to the method of access to the Internet, classified either as mobile phones or computers. In view of its extensive use, the first level of this paper sets the Internet usage as a virtual variable [24] and defines "whether to use the Internet" according to "whether to use computers to surf the Internet" and "whether to use mobile phones to surf the Internet" in the questionnaire. As long as you use one of these methods, the value is 1, otherwise the value is 0. The second level discusses the degree [25] of Internet use as a supplement to "whether to use the Internet", specifically reflected in the length of time of Internet use, which is represented by total time. In the questionnaire, there are two questions: "mobile device online time (minutes)" and "computer Internet time (minutes)". The total online time of the two is expressed by the sum of their online time. The result of the questionnaire shows that the interval of the total online time of the two is [0,1920] (minutes).

Control variable

This paper also includes some control variables, including age, education, place of residence [26], marital status [27], length of sleep [28], working status [29] and health status [30]. In terms of age, according to the actual age of the individual, it is treated as a continuous variable; in terms of education level, the educational background is divided into five categories, namely, primary school and below, junior high school, technical school/vocational school, junior college, undergraduate and above, which are assigned the values 1, 2, 3, 4, and 5, respectively. In terms of residence, they are divided into rural areas and urban areas, with values of 0 and 1, respectively. In terms of marital status, "no spouse" is assigned to 0 and "with spouse" to 1, in which divorce and bereavement are classified as "no spouse" and cohabitation as "with spouse". In terms of sleep time, it is treated as a continuous variable according to the daily sleep time (hours). In terms of working status, it is divided into two cases: on-the-job and unemployed, with a value of 1 and 0, respectively. From the labor market is included in unemployment and belongs to a class of people who do not have a job. In terms of physical health, "relatively healthy", "very healthy" and "pretty healthy" are classified as healthy, assigned as 1, "average" and "unhealthy" are classified as unhealthy, and assigned as 0. The details of variables are shown in the following Table 1.

Theory and Methods

Statistical analysis method

This paper uses R 4.3.0 to analyze the data of China Family Panel Studies (CFPS) and makes a descriptive statistical analysis of women's depression and Internet use.

Multiple linear regression

Based on the CFPS2018 survey data, the dependent variable (degree of depression), independent variable (Internet use) and control variable are defined. In this paper, the multiple linear regression method [31] is selected to establish an empirical model, and the formula is as follows:

$$StdCES-D8_i = \alpha_0 + \alpha_1 Internet_i + \beta_i Control_i + \varepsilon_i$$

Among them, the dependent variable $StdCES-D8_i$ is the standardized self-rated depression score [32] of the study subjects, which is used to measure women's mental health; the core explanatory variable $Internet_i$ represents Internet use, and α_1 is the coefficient to be evaluated; $Control_i$ represents the control variables such as age, education, residence, marital status, sleep duration, working status and physical health status. β_i is the vector of the

TABLE 1

Variables name and their meaning

Variables type	Variables representation	Variables name	Meaning and assignment
Dependent variable	StdCES-D8	Degree of depression	Calculate the self-rating score of depression
Independent variable	Internet	Internet use	According to whether or not to access the Internet, use the network = 1, do not use the network = 0
Control variable	Age	Age	Specific value
	Edu	Education level	Primary school and below = 1, Junior high school = 2, Technical school/Vocational school = 3, Junior college = 4, Undergraduate and above = 5
	Residence	Place of residence	Rural area = 0, Urban area = 1
	Marriage	Marital status	No spouse = 0, Having a spouse = 1
	Sleep	Length of sleep	Specific value
	Employ	Working status	Unemployment = 0, On-the-job = 1
	Health	Health status	Unhealthy = 0, Healthy = 1

parameter to be estimated, α_0 is a constant term and ε_i is a random error term.

Heterogeneity analysis and robustness test

Heterogeneity analysis [33] is used to study the differences between different groups (such as residence, age, etc.). Its main purpose is to check whether there are significant differences between groups, and then to determine whether certain factors have an impact on the data. This method of analysis is usually realized by regression analysis. In this paper, for people with different characteristics, the impact of Internet use on the degree of depression may be different, so we make a group regression from the four aspects of age, place of residence, marital status and physical health status to study the heterogeneous effects of different characteristics.

In order to test the robustness [34] of the regression results, this paper also changes the measure index of the variables and carries on the regression test again. In the previous section, the dependent variable was the degree of depression, which was expressed by the StdCES-D8; in the robustness test, it was replaced by the 0, 1 virtual variable. This means that non depression was assigned to 0 and depression was assigned to 1. In the previous section, the core explanatory variable is the use of the Internet, that is, a computer or mobile device. It is a virtual variable with values of 0 and 1. In the robustness test, replace it with women's understanding of the importance [35] of the Internet, if women think the Internet is very important, their frequency of using the Internet will also increase. And 1 indicates that the Internet is very unimportant and 5 indicates that the Internet is very important. The regression results are shown that only change the dependent variables or the core explanatory variables or changes in both variables.

Empirical Analysis

Descriptive statistical analysis

According to the research purpose of this paper, after eliminating invalid samples, we get a total of 7670 sample data, as shown in Table 2.

According to Table 2, it is found that the average self-evaluation score of CES-D8 of Chinese female residents is 16, which indicates that the depression of Chinese women is serious, and their mental health is not optimistic [36]. In terms of Internet use, Chinese women have a high degree of Internet use, of which 53.95% use the Internet, 46.05% do not use the Internet, and the average duration of Internet use is 135 minutes. In terms of age, the average age of the sample was 38 years old, of which the youngest was 19 and the oldest was 96. In terms of education level, 79.89% of the students had education in junior high school or below, 12.95% in senior high school/technical secondary school/technical school/vocational high school, 4.57% in junior college and 2.59% in college and above, respectively. The overall education level of the survey sample is on the low side, which may lead to an increase in the probability of depression. In terms of residence, 48.44% of Chinese women live in urban areas, and 51.56% of women live in rural areas, with a small difference between the two, but there are relatively more women living in rural areas. In terms of marital status, the vast majority of women have spouses, which is about 86.26%, while women without spouses account for 13.74%. In terms of sleep time, the average daily sleep time of women is 7.25 h, and the overall sleep time is better. Adequate sleep time and good sleep quality can promote women's mental health and reduce the occurrence of depression. In terms of working conditions, about 61.23% of women are working, and 38.77% of them are unemployed, including retired women. In terms of self-evaluation of physical health, 67.87% of women think that their bodies are healthy, while 32.13% of women think that they are unhealthy.

Through the description of the Internet use and mental health status of Chinese family women, it is found that the sample has the following characteristics: Chinese women have a large number of Internet users and low mental health status. In terms of individual characteristics, older women account for a higher proportion, with a low level of education, a larger proportion of women living in rural areas. There are more women with spouses and healthy bodies. In addition, it is also found that women sleep well as a whole, and more women have jobs.

Multiple linear regression

The results of multicollinearity test [37] between variables are shown in Table 3. The results show that the variance expansion factor among the variables satisfies $0 < VIF < 10$ and is much less than 10, and the minimum tolerance is 0.54 and greater than 0.10, indicating that there is no multicollinearity among the variables selected in this paper.

Table 4 reports the result of multiple linear regression estimates of Internet use on female depression. Model (1) mainly examines the influence of core independent variables on dependent variables; model (2) examines the influence of control variables on dependent variables; model (3) adds core independent variables on the basis of model (2), that is, the influence of Internet use on dependent variables. Model (4) adds the second level of independent variable on the basis of model (3), that is, the degree of Internet use, which is expressed by the total Internet time of mobile devices and computers.

In model (1), the effect of the core independent variable, namely Internet use, on women's depression self-assessment score was discussed. The results showed that the coefficient of independent variable was −0.347, which was significant at 1% statistical level. This primarily shows that the Internet use could negatively affect women's depression.

The influence of control variables on dependent variables is discussed in model (2). In the level of education, the influence coefficient of education on women's depression self-evaluation score is −0.093, and it is significant at the statistical level of 1%. It indicates that the higher their education level, the better their psychological status. In general, people with a high level of education are more concerned about their physical and mental health, and they have more adequate financial and social resources, so they are more able to ease their emotions and are less likely to suffer from depression than those with low level of education. The influence coefficient of residence type on

TABLE 2

Descriptive statistics

Variable		Mean/Proportion	SD	Min	Max
Dependent variable	CES-D8	16	4.0	8	32
	StdCE-D8	−0.47	1.07	−2	4
	Depression				
	Depressed = 1	10.98			
	Not depressed = 0	89.02			
Independent variable	Internet use				
	Use the network = 1	53.95			
	Do not use the network = 0	46.05			
	Total time	135	63.64	0	1,920
Control variable	Age	38	16.97	19	96
	Edu				
	Primary school and below =1	49.15			
	Junior high school = 2	30.74			
	Technical school/vocational school = 3,	12.95			
	Junior college = 4	4.57			
	Undergraduate and above = 5	2.59			
	Residence				
	Urban area = 1	48.44			
	Rural area = 0	51.56			
	Marital status				
	Having spouse = 1	86.26			
	No spouse = 0	13.74			
	Sleep	7.25	0.35	0.5	15
	Working status				
	On-the-job = 1	61.23			
	Unemployment = 0	38.77			
	Health status				
	Healthy = 1	67.87			
	Unhealthy = 0	32.13			

female depression self-rating score was −0.171, and it was significant at 1% statistical level, indicating that the mental health level of women living in urban areas was higher than that of women living in rural areas. This may be due to the differences in the level of economic development and infrastructure construction between urban and rural areas. In addition, the influence coefficient of having a spouse on the self-rating score of depression is −0.241, which is significant at the statistical level of 1%, indicating that women with spouses have better mental health than women without spouses. The study found that marital status can improve women's depression, especially from the companionship of their spouses [38], and women with spouses can get spiritual comfort and daily care from their spouses. In terms of age, the regression results show that the influence coefficient of depression self-rating score is −0.007, indicating that there is a negative correlation between age and depression. Although it is significant at the statistical level of 1%, the influence coefficient of age is smaller than other variables. The influence coefficient of physical health on women's depression self-rating score is −0.638, and it is significant at 1% statistical level, indicating that people who are physically healthy are also more psychologically healthy, while those who are not physically healthy may lead to more depression. The influence coefficient of sleep time on women's depression self-rating score is −0.075, and it is significant at the statistical level of 1%. The results show that moderate sleep time can effectively improve women's depression. Adequate and efficient sleep quality is particularly important for women's mental health, lack of sleep or long sleep and poor sleep quality are not conducive to women's mental health. Finally, the influence coefficient of working status on depression self-rating score is 0.074, which is significant at 5% statistical level, indicating that working women are more likely to develop depression. Rapid social development and subsequent greater work

TABLE 3

Multiple collinear diagnosis

Variable	Collinear statistics	
	VIF	Tolerance
Edu	1.57	0.64
Residence	1.16	0.86
Marriage	1.05	0.95
Employ	1.11	0.90
Health	1.13	0.88
Age	1.85	0.54
Sleep	1.04	0.96
Internet	1.81	0.55
Total time	1.61	0.63
Mean VIF	1.37	

stress may be important reasons for the poor mental health of women at work [39].

Model (3) adds core independent variables to model (2). The regression results show that the influence coefficient of Internet use on women's depression self-rating score is −0.125, which is significant at 1% statistical level, which indicates that women who use the Internet have lower self-rating scores for depression. This shows that the use of the Internet can improve women's mental health. The Internet is the product of the development of the society, and in the information society, women who use the Internet for interpersonal communication, entertainment and daily activities can effectively reduce depression and improve women's well-being in life.

Model (4) adds the second level of independent variable to model (3). According to Table 4, the influence coefficient of total online time on women's depression self-evaluation score is 0.0004, although the influence is small, but it is significant at 1% statistical level, which shows that excessive use of Internet, that is, Internet addiction can increase women's depression and do harm to women's mental health. To do this, we should use the Internet moderately.

Heterogeneity analysis

There are differences in the effects of Internet use on depression among different groups of women, so this paper makes a group regression [40] from the four aspects of residence type, age, marital status and physical health status to study the impact of Internet use on the mental health of women with different characteristics. Among them, with regard to age grouping, this paper makes reference to the division standard of age put forward by the World Health Organization and divides them into three categories: the first category is young people aged 44 and below, the second category is middle-aged people aged 45 to 59 years old and the last category is the elderly aged 60 and above. The specific regression results are shown in Table 5.

In terms of residence, the regression results show that the influence coefficient of Internet use on depression self-rating scores of women living in urban areas is −0.111, and that of women living in rural areas is −0.123. There is little difference between the two and both are significant at the statistical level of 1%, but relatively speaking, Internet use has a greater impact on women in rural areas. This is because children go to the city to study, go out to work and other factors lead to their long-term separation from their relatives, so they need to rely on the Internet to maintain emotional communication with their families. In addition, compared with urban areas, infrastructure construction in rural areas is backward, public entertainment places are less,

TABLE 4

Results of multiple linear regression estimation

	Model (1) StdCES-D8	Model (2) StdCES-D8	Model (3) StdCES-D8	Model (4) StdCES-D8
Edu		−0.093*** (0.014)	−0.079*** (0.014)	−0.092*** (0.014)
Residence		−0.171*** (0.025)	−0.161*** (0.025)	−0.167*** (0.025)
Marriage		−0.241*** (0.034)	−0.233*** (0.034)	−0.219*** (0.034)
Age		−0.007*** (0.001)	−0.009*** (0.001)	−0.008*** (0.001)
Health		−0.638*** (0.026)	−0.632*** (0.026)	−0.632*** (0.026)
Sleep		−0.075*** (0.008)	−0.077*** (0.008)	−0.077*** (0.008)
Employ		0.074** (0.025)	0.067** (0.025)	0.068** (0.025)
Internet	−0.347*** (0.018)		−0.125*** (0.029)	−0.164*** (0.031)
Total time				0.0004*** (0.00008)
Constant	−0.219*** (0.024)	1.304*** (0.106)	1.449*** (0.111)	1.415*** (0.111)
N	7,670	7,670	7,670	7,670
Adjusted R2	0.0104	0.1089	0.1109	0.1126

Note: Standard error in parentheses; $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

TABLE 5

Heterogeneity analysis

Dependent variable	**StdCES-D8**				
Grouping basis	**Residence**		**Age**		
Grouping	**Urban area**	**Rural area**	**Youth**	**Middle age**	**Old age**
Internet	−0.111*** (0.041)	−0.123*** (0.042)	−0.084 (0.060)	−0.102*** (0.043)	−0.134*** (0.055)
Control variable	Yes	Yes	Yes	Yes	Yes
n	3,715	3,955	2,475	2,478	2,717

Dependent variable	**StdCES-D8**			
Grouping basis	**Marital status**		**Health status**	
Grouping	**Having spouse**	**No spouse**	**Healthy**	**Unhealthy**
Internet	−0.142*** (0.031)	−0.037 (0.093)	−0.088*** (0.033)	−0.194*** (0.058)
Control variable	Yes	Yes	Yes	Yes
n	6,616	1,054	5,206	2,464

Note: Standard error in parentheses; $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

and goods are relatively scarce, so rural women need to rely on the Internet to obtain external information and resources. Therefore, the use of the Internet has a greater effect on the mental health of rural women.

In the heterogeneity analysis of age, this paper divides the age into three categories: young, middle-aged and old. It is found that the influence coefficient of Internet use on the depression of young women is −0.084, and the influence coefficient of Internet use on the depression of middle-aged women is −0.102 ($p < 0.01$), and that of old women is −0.134 ($p < 0.01$). This may because for younger women, older women have fewer facilities [41] for entertainment and are not as functional as young women, thus their experience of using the Internet increased.

With regard to marital status, the impact coefficient of Internet use on the mental health of women with spouses is −0.142, and that on the mental health of women without spouses is −0.037. The former is significant at 1% statistical level, indicating that Internet use can significantly improve the depression of spousal women, while the impact on the mental health of women without a spouse is not significant. On the one hand, women with spouses need to take care of their families, and they have less contact with the outside world than women without spouses, so their use of the Internet is higher. The Internet can help them broaden their horizons, relieve depression and better integrate into society. On the other hand, unmarried women are more likely to establish social relationships with their peers in their daily life, participate in real-life entertainment projects to alleviate their depression and improve their mental health.

In terms of physical health, the influence coefficient of Internet use on depression of healthy and unhealthy women was −0.088 ($p < 0.01$) and −0.194 ($p < 0.01$), respectively. It shows that Internet use can significantly improve the mental health level of physically healthy and unhealthy women. Among them, the impact of Internet use on unhealthy women is more significant. This may be because for women who are physically unhealthy, physical illness brings more psychological suffering, and there is no other way to alleviate the pain. The use of the Internet can divert attention, ease their depression and generate positive emotions.

Robustness test

In order to test the robustness of the regression results, this paper also changes the measure index of the variables and carries on the regression test again. What is changed in the model (5) is the core independent variable, which is expressed by women's understanding of the importance of the Internet, specifically expressed as if women think the Internet is very important, then the assignment is 5, and so on. If women think that the Internet is very unimportant, then the assignment is 1, expressed by importance, and the other variables remain unchanged. In model (6), the dependent variable was represented by virtual variable of depression or not, and the other variables remained unchanged. The score of CES-D8 ≥ 20 indicates depressive symptoms, and the value was 1. While CES-D8 < 20 indicates no depressive symptoms and is assigned a value of 0. Since the value of the dependent variables is 0 or 1, we use a logistic regression model for analysis. The model (7) changes both the dependent variable and the independent variable, and the other variables remain unchanged. We also use logistic regression models. The results of three times of regression are shown in Table 6.

From the regression results, it can be found that whether only changing the dependent variables or only the core independent variables, or changing two variables at the same time, the regression results are roughly the same as the original regression, that is, the impact of Internet use on women's depression is negative and significant at 10% statistical level.

Model (5) replaces the core independent variable with the variable of women's perception of the importance of the Internet. The regression results show that the influence coefficient of women's perception of the importance of the

TABLE 6

Robustness test

	Model (5) StdCES-D8	Model (6) Depress	Model (7) Depress
edu	−0.089*** (0.014)	−0.205*** (0.054)	−0.222*** (0.053)
Residence	−0.168*** (0.025)	−0.239*** (0.082)	−0.242*** (0.082)
Marriage	−0.238*** (0.034)	−0.456*** (0.102)	−0.459*** (0.102)
Age	−0.008*** (0.001)	−0.007** (0.003)	−0.006* (0.003)
Health	−0.633*** (0.026)	−1.313*** (0.081)	−1.311*** (0.082)
Sleep	−0.075*** (0.008)	−0.159*** (0.025)	−0.157*** (0.025)
Employ	0.075*** (0.025)	0.118 (0.084)	0.131 (0.084)
Internet		−0.212** (0.096)	
Importance	−0.018** (0.009)		−0.049* (0.028)
Constant	1.389*** (0.114)	1.038*** (0.354)	1.042*** (0.363)
n	7,656	7,670	7,670

Note: Standard error in parentheses; $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Internet on depression is −0.018, indicating that when women think the Internet is more important, their frequency of using the Internet will increase, and the score of depression self-assessment will decrease. It shows that the use of the Internet can alleviate women's depression.

In model (6), the self-rating depression score (StdCES-D8) is replaced by a virtual variable (depress) of whether women are depressed or not. The regression results show that the coefficient of independent variable is −0.212 and is significant at 5% statistical level, which indicates that Internet use has a significant negative effect on women's depression, and women who use the Internet are less likely to be depressed than women who do not use the Internet.

In model (7), the core independent variable and the dependent variable are changed at the same time. According to the data in Table 6, the influence coefficient of women's perception of the importance of the Internet on their depression is −0.049 ($p < 0.1$), and the influence coefficient is small. This coefficient shows that women's awareness of the importance of the Internet will reduce their depression, so proper use of the Internet can improve women's mental health.

The three regression results confirmed that Internet use can significantly reduce women's depression and proved the robustness of the relationship between Internet use and depression. In addition, from the results of each regression, the role of most variables is still significant, indicating that the selection of variables is effective and reasonable.

Summary and Discussion

As a new type of media, the Internet plays an important role in modern society, which not only provides a lot of convenience to people's daily life, but also brings a variety of challenges. The current situation of contemporary women's survival [42] is a complex and multi-dimensional problem, which involves many fields such as society, economy, politics and culture. Under the background that the status and rights of women have been significantly improved, they are still faced with the problems of gender discrimination [43] and unequal treatment, which leads to the poor mental health of women. For this reason, this paper explores the impact and mechanism of Internet use on women's mental health, obtains some valuable research conclusions, and puts forward relevant countermeasures and suggestions.

Conclusion

Based on CFPS2018 data, this paper selects Chinese women as the research object, uses multiple linear regression model to analyze the impact of Internet use on female depression, and tests the robustness of the regression results. It also analyzes the impact of Internet use on the mental health of women with different places of residence, age, marital status and physical health status. The following four conclusions can be drawn:

First, Internet use has a significant inhibitory effect on women's CES-D8 score, that is, Internet use can significantly promote women's mental health, that is to say, Internet use can reduce women's depression self-assessment scores and alleviate their depression; and passed the robustness test, indicating that the conclusions based on the regression model are highly scientific and robust.

Second, the study found that Internet usage, that is the total time spent on the Internet with mobile devices and computers had a significant positive effect on women's CES-D8 self-assessment scores, that is, excessive use of the Internet not only did not reduce women's depression scores, but increased women's depression.

Third, women's age, education, place of residence, marital status, length of sleep, working status and physical health are the main factors that affect the mental health of women in China. Among them, the influence of working status on female depression self-assessment score is positive, while the other variables on female depression self-assessment score are negative, which significantly improve the mental health level of women.

Fourth, Internet use is heterogeneous for female depression. Internet use can promote the mental health of women living in different places, especially in rural areas, and Internet use can significantly improve the mental health level of middle-aged and elderly women. However, it has no significant effect on the mental health level of young women. Internet use has a negative effect on the depression of women with different marital status, among which it has a significant effect on the mental health of women with spouses, but it has no significant effect on the mental health level of unmarried women. The use of the Internet can promote the mental health level of women with different physical health status, and the promoting effect on unhealthy women is stronger than that of physically healthy women.

Countermeasure and suggestion

According to the results of empirical analysis, this paper puts forward the following three suggestions:

First, improve the popularity of the Internet. The use of the Internet can significantly improve the mental health level of women, so it is very important to speed up the construction of Internet infrastructure [44] and improve the effective coverage of the Internet in the whole country. In urban areas, basically achieve full coverage of the urban network, especially in shopping malls, hospitals, stations, airports and other public places to provide free network, to provide basic conditions for women to use the Internet. Compared with urban areas, the Internet coverage in rural areas is low, resulting in some rural women in a state that they do not understand the Internet and do not know how to use the Internet. The infrastructure construction of the Internet in rural areas of our country needs to be strengthened urgently. In addition, for older women, special personnel and posts need to be set up to answer the questions when they encounter in the use of the Internet, so that Internet technology can benefit more elderly people.

Second, reasonably control the time of using the Internet. The study found that excessive use of the Internet can increase depression in women, so it is necessary to control the amount of time spent using the Internet. Arrange the time on the Internet reasonably and treat the network entertainment resources correctly. Moderately surfing the Internet can alleviate the stress in life and reduce the occurrence of depression, while excessive indulgence on the Internet will lead to the neglect of communication in real life. The gap between the virtual world [45] and the real world will produce a sense of loss and feel that I cannot integrate into real life, which leads to depression.

Third, purify the network environment and create a good atmosphere for network use. The government should strengthen the construction of network civilization, strengthen the control and supervision [46] of network media, actively guide the correct norms of Internet media behavior, and weaken the transmission mechanism of the negative impact of the Internet on social trust as far as possible.

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