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A Study on the Impact of Digital Literacy on the Subjective Well-being of the Elderly

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***ABSTRACT** :With the rapid development of information technology, digital literacy has become a key factor for the elderly to integrate into modern society and improve their quality of life. Taking Lujiang County, Anhui Province as an example, this study collected data related to digital literacy and the well-being of the elderly through questionnaire surveys and field interviews, and constructed a multiple linear regression model to analyze the influence mechanism of digital literacy on the well-being of the elderly. The final conclusion is that there is a significant positive correlation between digital literacy and the well-being of the elderly. Among the dimensions of digital literacy, technology use literacy and security and privacy literacy have particularly prominent effects on improving well-being. Based on the above conclusions, this paper conducts an in-depth analysis of the influence mechanism of digital literacy on the well-being of the elderly, and combines Maslow's hierarchy of needs theory and social interaction theory to put forward specific countermeasures and suggestions for improving the digital literacy of the elderly from the three levels of government, society and family. These countermeasures and suggestions aim to help the elderly cross the digital divide through multi-dimensional and multi-level interventions, enhance their adaptability and quality of life in the digital age, and thereby strengthen their sense of well-being.*

***KEYWORDS** :active aging, digital literacy;,the elderly, subjective well-being*

I INTRODUCTION

The data of the seventh national census show that the group aged 60 and above accounts for 18.70% of China's total population, and the group aged 65 and above accounts for 13.50% of the country's total population, indicating that China has crossed the threshold of moderate aging. In the "Decision of the Central Committee of the Communist Party of China on Further Comprehensively Deepening Reform and Promoting Chinese-style Modernization", General Secretary Xi Jinping clearly demanded: promote the national level population aging

response strategy and expand the elderly care service and elderly care industry. Existing research focuses more on the impact of factors such as financial support, health status, and family relationships on well-being[1]. Digital literacy has become one of the basic literacy that modern citizens should have, and improving the digital literacy of the elderly can help the elderly integrate into digital social life[2]. Therefore, this study takes Lujiang County, Anhui Province as an example, takes digital literacy into the scope of consideration, and deeply explores the impact of digital literacy on the well-being of the elderly, aiming to optimize digital education for the elderly, promote the development of digital products for the elderly, and provide reference for the formulation of elderly care policies.

II DEFINITION OF RELATED CONCEPTS

2.1 Digital literacy

The concept of digital literacy was first proposed by Eshet-Alkalai, who believes that digital literacy is a multi-dimensional concept that refers to the ability of individuals to effectively obtain, understand, use, create and disseminate digital information in the digital environment, as well as the literacy and behavioral norms shown in the use of digital technology[3]. Combined with the literature content, this paper mainly summarizes from five dimensions: digital information acquisition, technology use, communication and cooperation, security and privacy, and innovation and creation[4].

Digital information access literacy refers to an individual's ability to acquire, screen, analyze, integrate and apply information in the digital environment. Technology literacy refers to an individual's ability to skillfully operate and use various digital devices and related software and applications; Communication and cooperation literacy refers to an individual's ability to effectively communicate and collaborate with others through various tools in the digital environment. Security and privacy literacy is an individual's ability to protect their information security and privacy in the digital environment. Innovation and creativity literacy is the ability of individuals to use digital technology to think and create innovatively in the digital environment.

2.2 Happiness for the elderly

Happiness is a comprehensive evaluation of an individual's quality of life, which is a subjective psychological experience that covers multiple levels such as emotional, cognitive and social[5]. For the elderly, happiness is not only reflected in satisfaction with life, but also involves five dimensions: mental health, social support, family relationships, and self-realization.Life satisfaction is a key indicator to measure the happiness of the elderly, which comprehensively reflects the subjective evaluation of the elderly in terms of housing, economy, health and social participation. Mental health is the cornerstone of happiness for the elderly, covering emotional stability, stress coping, and more. Social support can alleviate the loneliness of the elderly, enhance the sense of belonging and security, of which family relationships are the core of social support, and harmonious family relationships can provide emotional comfort and life care for the elderly. Self-realization is the sense of value, accomplishment and control of life gained by the elderly at the spiritual level, and it is also an important part of happiness.

III OVERVIEW OF LUJIANG COUNTY

Lujiang County, belonging to Hefei City, Anhui Province, is located in the central part of Anhui Province, and the overall economic strength of Lujiang County is superior in the county economy of Anhui Province. According to the data of the seventh census, the permanent population of the county is 888238, the age structure of the population aged 0-14 accounts for 17.22%, the population aged 15-59 accounts for 60.77%, the population over 60 years old accounts for 22.01%, and the population over 65 years old accounts for 17.8%, compared with the data of the sixth census, the permanent population of Lujiang County has decreased by 85,612, a decrease of 8.79%The proportion of the population aged 60 and above increased by 5.80%, and the proportion of the population aged 65 and above increased by 7.17%. This shows that the aging of the population in Lujiang County is deepening, which can provide sufficient and representative elderly population as the research object for this questionnaire survey.

IV QUESTIONNAIRE DESIGN AND EMPIRICAL ANALYSIS

4.1 Variable selection and reliability and validity analysis

Explained variables: Elderly well-being, the well-being of the elderly is an individual's subjective comprehensive evaluation of their own quality of life, which is not only reflected in life satisfaction, but also involves mental health, social support, family relationships and self-realization. See TABLE 1 for details.

Table 1 Measures of well-being

Interpreted variable	Dimensions	Title	Cronbach.α coefficient
Happiness for the elderly	Life satisfaction	Satisfied with the surrounding environment of the village (or community).	0.702
		Harmony with the people in the village (or community).	
	Mental health	Feeling lonely often	0.827
		Nobody really cared about me	
		Often unable to fit into the conversations of those around you	
		Lack of real friends	
	Social support	Use your smartphone to participate in the poll	0.846
		Use your smartphone to conduct business	
		Use your smartphone to pay online medical insurance	
	Family relationships	My children often share their living conditions with me	0.669
		My children pay attention to my preferences	
		My children provided financial support when I was sick	

		My children often contact me through smart products	
	Self-actualization	Have time to do what interests you	0.712
		Using a smartphone allows me to better fulfill my hobbies	
		Using smartphones allows me to better integrate into society	

Core explanatory variables: digital literacy, digital literacy refers to the ability of individuals to effectively obtain, understand, use, create and disseminate digital information in the digital environment, as well as the literacy and behavioral norms shown in the use of digital technology, including digital information access literacy, technology use literacy, communication and cooperation literacy, security and privacy literacy, and innovation and creativity literacy. See TABLE 2 for details.

Table 2 Measurement of digital literacy

Core explanatory variables	**Dimensions**	**Title**	**Cronbach.α coefficient**
Digital literacy	Digital access literacy	Use your smartphone to search for information	0.852
		Use your smartphone to stay up to date with the news	
		Use the medical platform for online consultation	
		Use your smartphone to participate in online learning	
	Technology literacy	Use digital payments	0.848
		Use online shopping software	
		Use social media platforms	
		Use a short video app	
	Communication and cooperation literacy	Use smart products to improve communication with your family	0.713
		Understand the rules and policies of social platforms	
		Like, comment, and retweet posts on social platforms	
		Meet new people through short videos	
	Safety literacy	Keep your mobile phone password and account information safe	0.615
		Download anti-fraud apps to prevent online fraud	
		Clearly distinguish the authenticity of short videos	

	Innovative literacy	Proficient in using editing and dubbing software	0.738
		Use your smartphone to give advice on public services	

Control variables: the basic personal characteristics of the elderly, which mainly include age, gender, education level, marital status, number of children, cohabitation, physical condition and economic status

Table 3 Variable definitions and descriptive statistics

Variable type	Variable name	symbol	Minimum	Maximum	mean	Standard deviation	Variance
Dependent variable	Well-being	Happy	9.58	19.33	14.7785	1.75382	3.076
Independent variables	Digital literacy	Digital	5.00	25.00	10.9769	3.80098	14.447
Control variables	Age	m1	1	2	1.51	0.502	0.252
	Gender	m2	2	5	3.19	0.804	0.647
	Educational level	m3	1	5	2.11	1.023	1.046
	Marital status	m4	1	4	2.43	0.853	0.728
	Number of children	m5	1	4	2.72	0.972	0.945
	cohabitation	m6	1	5	2.97	1.047	1.096
	Physical condition	m7	1	5	2.40	0.880	0.774
	economic situation	m8	1	5	2.68	0.755	0.571
Number of valid cases (in columns)				155			

TABLE 4 provides the validity analysis results of two variables, digital literacy and well-being. Validity refers to the degree to which the measurement tool can accurately measure the concept to be measured, and KMO values and Bartlett spherical tests are commonly used validity test methods. It can be seen from the table that the KMO values of digital literacy and well-being are 0.889 and 0.765, respectively, both of which are greater than 0.7, which indicates that these data are suitable for factor analysis and have good structural validity. The significance results of Bartlett's spherical test were also 0, which further verified the validity of the variables, indicating that the selected items could well reflect the concepts of digital literacy and well-being, and the research tools had high validity.

Table 4 Sample validity analysis results

variable	KMO value	Bartlett spherical test		
		Approximation of chi-square	Degree of freedom	Significance
Digital literacy	0.889	1746.054	136	0
Well-being	0.765	1089.214	120	0

4.2 Model construction and result analysis

In order to explore the impact of digital literacy on the well-being of the elderly and its mechanism, this paper constructs a model of the impact of total digital literacy on well-being based on literature review and theoretical basis. The specific model (1) is set as follows:

$$Happy_i = \beta_0 + \beta_1 Digital_i + \sum \beta_k Control_{ki} + \mu_i \quad (1)$$

Among them, $Happy_i$it represents the subjective happiness of the ith rural residents; the overall level of digital literacy of residents; $Digital_i$ represents a series of control variables, $Control_{ki}$ including gender, age, education level, income, health status, etc.; β_0 is the constant term, β_1、β_k is the coefficient to be estimated, and μ_i is the random perturbation term.

In order to further explore which digital literacy has the most significant impact on well-being, a model of the five dimensions of digital literacy affecting well-being (2) is further constructed:

$$Happy_i = \beta_0 + \beta_1 D_{1i} + \beta_2 D_{2i} + \beta_3 D_{3i} + \beta_4 D_{4i} + \beta_5 D_{5i} + \sum \beta_k Control_{ki} + \mu_i \quad (2)$$

Among them, D1 is digital information access literacy; D2 is technical literacy; D3 is communication and cooperation literacy; D4 is security and privacy literacy; D5 is innovation and creativity literacy.

Since the measurement of the well-being of the elderly in the questionnaire is 1-5 levels, and Y has a continuous value, this paper uses the OLS model and uses SPSS26 software to make an empirical analysis of the relationship between digital literacy and the well-being of the elderly.

Table 5 Regression analysis of total digital literacy on well-being

	model	Coefficients not normalized		Standardization coefficient	t	Significance
		B	Standard error	Beta		
（1）	(constant)	11.897***	0.356	/	33.395	0.000
	Digital literacy	0.262***	0.031	0.569	8.556	0.000
	R2			0.324		
	Adjusted R2			0.320		
	F and P values			F=73.21，p<0.001		

*p<0.05*p<0.01**p<0.001***

Univariate linear regression analysis was carried out with total digital literacy as the independent variable and happiness as the dependent variable. The results show that the model is significant as a whole, indicating that total digital literacy has a significant positive predictive effect on happiness, that is, the higher the level of total digital literacy of individuals, the higher the level of happiness.

Table 6 Regression analysis results of five dimensions of digital literacy on well-being

model	Coefficients not	Standardization	t	Significance

		normalized coefficient				
		B	Standard error	Beta		
	(constant)	11.674***	1.030	/	11.337	0.000
	m1	0.153	0.247	0.044	0.621	0.536
	m2	0.194	0.153	0.089	1.269	0.207
	m3	0.123	0.130	0.072	0.948	0.345
	m4	0.222	0.149	0.108	1.496	0.137
	m5	-0.011	0.136	-0.006	-0.084	0.933
	m6	0.164	0.114	0.098	1.436	0.153
	m7	-0.257	0.144	-0.129	-1.789	0.076
	m8	-0.408*	0.169	-0.176	-2.420	0.017
（2）	Digital access literacy	-0.020	0.249	-0.010	-0.081	0.935
	Technology literacy	0.640***	0.186	0.391	3.447	0.001
	Communication and cooperation literacy	0.231	0.266	0.099	0.869	0.387
	Security and privacy literacy	0.297*	0.134	0.176	2.214	0.028
	Innovation and creativity literacy	-0.083	0.225	-0.041	-0.370	0.712
	R2	0.438				
	Adjusted R2	0.386				
	F and P values	F=8.458，p<0.001				

*p<0.05*p<0.01**p<0.001***

Multiple linear regression analysis was conducted with well-being as the dependent variable, and the five dimensions of digital literacy and the control variable as the independent variable, and the results are shown in TABLE 6. The overall model was significant (F=8.458, p<0.001), and the adjusted R2=0.386 showed that the model could explain 38.6% of the well-being variation. Among the dimensions of digital literacy, technology literacy (B=0.640, p<0.01) and security privacy literacy (B=0.297, p<0.05) had a significant positive predictive effect on well-being, with technology literacy having the strongest influence effect. The impact of digital information acquisition literacy, communication and cooperation literacy and innovation and creation literacy is not significant. Among the control variables, only m8 had a significant negative effect on well-being (B=−0.408, p<0.05), while the other control variables had no significant effects.

V SUGGESTIONS

5.1 Government level: system and facility guarantee based on the level of demand

The government can introduce a subsidy policy for the purchase of smartphones to encourage the elderly who do not yet own smartphones to buy, among which priority is given to the elderly with special difficulties such as the elderly, living alone, and empty nesters, and giving them higher price subsidies to meet the basic needs of the elderly for smart devices. In addition, improving the level of network infrastructure is a key part of completing the digital transformation of the elderly group, and relevant departments must accelerate the promotion of wireless communication networks, ensure stable signal transmission, and formulate special improvement plans for remote places or places where signal coverage is not available. Only by creating an efficient and reliable network connection environment can the elderly better integrate into the information ecosystem of modern society.

5.2 Social level: support network construction based on social interaction theory

The community can cooperate with social organizations to regularly hold various digital skills training courses, by professionals or volunteer teams to give face-to-face guidance to the elderly group, the course arrangement should be close to the actual needs of the elderly, the content should involve the basic operation of smart phones, anti-fraud knowledge, etc., with the aim of allowing the elderly to learn some basic digital skills, so as to improve the efficiency of obtaining information and the level of social interaction in their daily lives; In addition, as an important subject of social and economic activities, enterprises should actively assume the responsibility of promoting the development of digital products and services for the elderly, strive to pool resources, actively develop digital products and services suitable for the elderly, and infiltrate the concept of age-appropriate design into the management of the entire life process of products. By enlarging font icons, adding voice prompt functions, etc., it reduces the difficulty of operation for the elderly when using digital products.

5.3 Family level: intergenerational interaction and driven by emotional support systems

During digital transformation, promoting intergenerational communication is the main way to bridge the digital divide and a strong support for improving the quality of life of the elderly. Children should take the initiative to purchase suitable digital equipment for their parents, install simple and easy-to-use software, and actively pay attention to their progress in digital technology learning, patiently give operational guidance, and use weekends to carry out "one-on-one" teaching activities, and explain in detail the operation steps of basic functions such as taking photos with smartphones, texting and using social softwareYou can contact specific application scenarios for professional analysis to help them slowly solve the problems encountered in the learning process. Family members can maintain daily interaction with the elderly through social platforms such as WeChat, share bits and pieces of life, and care about the living conditions and health of their elders from an emotional level through regular video calls.

VI CONCLUSION

Based on Maslow's hierarchy of needs, social interaction theory and new human capital theory, Lujiang County, Anhui Province as the sample area, using questionnaire survey and empirical analysis to comprehensively explore the influence mechanism of digital literacy on the well-being of the elderly. Digital literacy can significantly improve the happiness of the elderly as a whole, with the two dimensions of technology literacy,

security and privacy literacy playing a particularly prominent role in improving happiness. In addition, poor economic conditions will significantly weaken the happiness of the elderly, which reminds us to pay full attention to their basic living security when promoting digital literacy education for the elderly. Based on the above views, this paper puts forward practical paths and suggestions to improve the digital literacy of the elderly from the three dimensions of government, society and family, which aim to help the elderly cross the digital divide and better integrate into the digital society, thereby improving their happiness in life.

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