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The Impact of Internet Use on Optimism: Some Empirical Evidence from China

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Abstract

Objective: Optimism is positively related to mental health and has been proven to have many other bene-fits to individuals. Therefore, in positive psychology, it's important to study what may affect optimism. In this study, Internet use is supposed to have a causal effect on optimism since the Internet is a kind of medium, and according to present studies, media use may influence optimism. The object of this study is to empirically identify the causal effect of Internet use on residents' optimism and to analyse the mechanism.

Methods: The research scope is limited to China. Optimism is measured by Life Orientation Test-revised (LOT-R) scale. The data used for empirical analysis come from the 2017 Chinese General Social Survey (2017) (N = 3955) and the National Bureau of Statistics of China. Descriptive statistics, ordinary least squares regression (OLS), two stage least squares regression (2SLS) (Internet penetration rate by province is selected as the instrumental variable), quantile regression (QR), and ordered logit regression is used for empirical analysis.

Results: Internet use can significantly improve residents' optimism level. When evaluated at the mean optimism level of 21.35, the marginal effect of Internet use is 1.5% and 13% under the OLS and 2SLS methods, respectively. An increase in the level of Internet use (measured by the frequency of Internet use and daily online time, respectively) also significantly improves residents' optimism level. Several robustness checks support that the impact of Internet use and an increase in the level of Internet use on optimism is robust. In mechanism analysis, the impact of Internet use on confidence in social development, social resources, and physical health conditions is also found to be significant and positive.

Conclusions: Internet use has a positive causal effect on optimism. Enhancing confidence in social development, enriching social recourses, and improving physical health condition are three channels through which Internet use has a positive impact on optimism. Our study provides a new perspective to explore what may affect optimism and indicates the importance of enhancing the Internet penetration rate and strengthening media governance. Our results also indicate that moderate Internet use may have a positive influence on mental health by improving one's optimism.

KEYWORDS

Internet use, media, dispositional optimism

INTRODUCTION

Optimism is an important concept in positive psychology. A major point of view treats optimism as a personality trait and defines optimism as “generalized expectations of the occurrence of good outcomes in one’s life.” [1] Optimism is relatively stable across time and context and is not limited to a particular behavioral domain or class of settings. When encountering difficulties, the expectation that a good outcome will happen in the future can improve one’s effort to achieve the goal. Early studies found that, unlike pessimists, optimists tend to use more problem-focused coping strategies and seek social support [2,3]. More recently, a large number of studies hold that optimism has a positive influence on mental health, and has many other benefits such as improving marital satisfaction and academic performance [4-9].

While optimism is relatively stable, it may also change [10,11]. Factors that may affect optimism can be roughly divided into four aspects, namely, individual differences, family environment, social environment, and therapies [6,8,12-17]. In terms of individual differences, genes, gender, age, education level, religious belief, personal experience, and socioeconomic status may relate to optimism. In terms of family environment, the mental states of parents, family intimacy, and family

income may affect children's optimism. In terms of social environment, level of economic development, political, cultural, and media environment may affect one's optimism. In addition, some literature has discussed the possibility to improve optimism through specific therapies.

The Internet has been deeply involved in people's daily life. In this paper, we attempt to identify the causal effect of Internet use on optimism. We treat the Internet as a kind of medium, and the use of the Internet is closely related to optimism since media may affect optimism [18,19]. Specifically, the social environment may have an impact on optimism, and media play an intermediary role when people obtain information from the social environment. Rages-to-Riches stories in the media may make people believe that anything and everything wonderful is possible; It also is the case that evening news with stories about the horrors that lurk around every corner may lead people to become helpless. Following this logic, we assume that within a certain period, if the information about social development in the mass media of a country is mainly positive, people's confidence in social development will be enhanced. As a result, people will be more optimistic about their own future.

The Internet is developing rapidly and penetrating widely among people. Its social influence and its change in people's lifestyles are expanding [20]. In this context, exploring the impact of Internet media use on optimism is of great value. Two recent studies shed light on this topic. One points out that media exposure to negative information, say, armed conflict events have a negative impact on optimism [21]. According to the other, hedonic (pleasure-seeking) media use and eudaemonia media use (using media to gain insight and seek meaning) may improve optimism [22]. However, while these studies provide evidence that Internet use may relate to one's optimism, neither the causal effect behind them nor the channels that Internet use may have an impact on optimism have been discussed explicitly.

We limit our research scope to China and hope to achieve the two goals below. First, we hope to identify the causal effect of Internet use on optimism. Second, we aim to find out that Internet use affects optimism through which channels. Specifically, we hope to check whether Internet use has an impact on optimism through the three channels below. First, Internet use makes people more optimistic by enhancing their confidence in social development. Second, considering that apart from providing information about the social environment, Internet media also provide people with social platforms and tools to acquire specific knowledge (for example, health knowledge) and that accumulation of social resources and improvement of health status may have a positive impact on optimism [11,23,24], we also aim to check whether Internet use affects optimism through accumulating one's social resource and improving one's health level.

To achieve our goals, OLS, 2SLS, quantile regression, and other methods are used for empirical analysis. We find that both Internet use (compared to not using the Internet) and the increase in Internet use has a positive impact on optimism. In addition, enhancing confidence in social development, accumulating social resources, and improving physical health status are three channels through which Internet use predicts an increase in optimism.

The main contributions of our study are twofold. First, we identify the causal effect of Internet use on optimism, which provides a new perspective to explore what may affect optimism. Second, we identify three mechanisms by which Internet use affects optimism. In addition, in terms of policy implication, our study also affirms the importance of enhancing the Internet penetration rate and strengthening media governance.

Research hypotheses

Based on our discussion above, we proposed our first research hypothesis (H1):

H1: Internet use has a positive impact on residents' optimism.

Apart from whether to use the Internet, a plausible conjecture is that different levels of Internet use may affect optimism differently. The level of Internet use can be measured by the frequency of Internet use and daily online time, which are both supposed to positively affect optimism. Specifically, we proposed our second hypothesis (H2), which consists of two hypotheses H2a and H2b.

H2a: The frequency of Internet use has a positive impact on residents' optimism.

H2b: The increase in daily online time has a positive impact on residents' optimism.

In terms of mechanism, we propose our third hypothesis (H3) to check the channels that Internet use affects optimism based on our discussion above. It consists of three hypotheses H3a, H3b, and H3c.

H3a: Internet use improves residents' confidence in social development.

H3b: Internet use helps residents accumulate social resources.

H3c: Internet use helps residents to become healthier physically.

METHODS

Data

The data in this study are selected from the Chinese General Social Survey (CGSS) in 2017, which is carried out by the China Survey and Data Center of Renmin University. Starting in 2003, the program surveyed more than 10,000 households in China annually. CGSS2017 has 12582 effective samples, and one main characteristic of this year's survey is that it contains questions about Internet use. The questionnaire of CGSS2017 consists of A, C, and D three modules. Interviewees who answer C and D modules are sub-samples who are randomly selected from the total survey object, and they don't overlap each other. The variables used in this study are mainly selected from module A and module D. We also use variables from module C for mechanism analysis.

Variables

Dependent variable

Optimism is selected as the dependent variable in our study. It is assessed by the LOT-R (Life Orientation Test-revised) scale [2] from question D39 in CGSS2017. This scale is one of the most widely used scales to measure dispositional optimism around the world [25]. The original scale is a 5-point Likert

scale consisting of 10 items and 4 of them are filler items. The version in CGSS2017 removes 4 filler items and the response format of items is *1 = strongly agree, 5 = strongly disagree*, and so on. We adjust the response format to *1 = strongly disagree, 5 = strongly agree*, and so on and sum up all 6 items to compute an overall optimism-score (Negatively worded items are reverse coded before scoring). Thus, optimism scores in principle range from 6 to 30.

The result of descriptive statistics shows that the mean optimism level is 21.35 in our sample. This indicates that individuals are generally optimistic, which is consistent with many previous studies [8,12,13].

Independent variables

Internet use is selected as the independent variable in our study. It is measured by question A30e in CGSS2017: "*Have you ever surfed the Internet in the last six months, including using computers, mobile phones, smart wearables, and other devices to access the Internet*." The options under the question are "*Yes*" and "*No*". In addition, considering that there are differences in the frequency of Internet use and daily online time among people, we measure the level of Internet use by following two questions. First is question A285: "*In the past year, your use of the Internet (including mobile Internet access), was*". The options under the question are "*Never*", "*Seldom*", "*Sometimes*", "*Frequently*" and "*Very Frequently*". Second is question A30c: "*In the past year, how much time (unit: minute) did you usually spend surfing the Internet on your computer or reading advice and articles through various applications such as WeChat and Weibo*?" In Figure 1 below, we present the distribution of optimism conditional on Internet use. It's obvious that those who have surfed the Internet in the past six months have a higher average optimism level than those who haven't, which provides preliminary evidence that Interuse use may improve optimism.

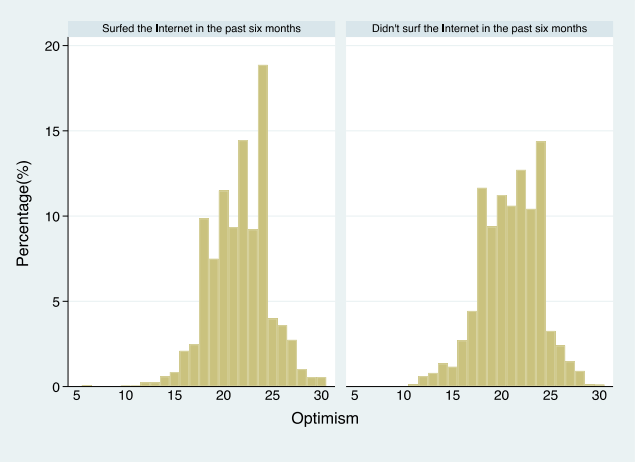

FIGURE 1. Internet use and optimism

Control variables

Based on the present literature, and considering data accessibility and measurement error problem, we select *gender* (male=1, female =0), age, *education level* (never access education=0, below elementary school=1, primary school=2, junior high school=3, high school (including vocational high school, technical high school, and technical secondary school)=4, collage and undergraduate=5, postgraduate =6), *maternal education level* (never access education=0, below elementary school=1, primary school=2, junior high school=3, high school=4, collage and postgraduate=5), *religion* (atheist =1, believe in religion =0), household registration (urban=1, rural =0) and *estate* (including co-ownership estates) as our control variables. Among them, maternal education level is a proxy variable that roughly controls the impact of family environment on individuals' optimism; household registration is a proxy variable that controls the impact of different social environments between urban and rural areas in China on optimism; the number of estates owned is a proxy variable that controls the impact of different socioeconomic status on optimism; other variables are commonly used in optimism study.

Models

Baseline model

In the baseline model, we use the ordinary least squares (OLS) method to empirically test the impact of Internet use on optimism and propose the following model

$$Optimism_i = \alpha + \beta Internet_i + \gamma controls_i + \varepsilon_i \quad (1)$$

Where *Optimism* represents the optimism level of resident *i*, *Internet* is a dummy variable that equals 1 if the resident *i* used the internet in the last six months, and 0 otherwise. *Controls* represents a vector of the control variables, and ε is the error term. The parameter β is what we focus on.

Extended model

In the extended model, we use the OLS method to empirically test the impact of the frequency of Internet use and daily online time on optimism. Specifically, the impact of the frequency of Internet use on optimism is tested by the following model

$$Optimism_i = \alpha + \beta Frequence_i + \gamma controls_i + \varepsilon_i \quad (2)$$

Where *Frequence* is the frequency of Internet use.

The impact of daily online time on optimism is tested by the following model

$$Optimism_i = \alpha + \beta Time_i + \gamma controls_i + \varepsilon_i \quad (3)$$

Where *Time* is the logarithm of the daily online time of resident *i*. (In order to avoid the effects of extreme observations, we remove the observations above 95th quantiles, namely, average daily online time more than 300 minutes.)

RESULTS

Internet Use and Optimism

The baseline results derived from equation (1) are presented in Table 1. In column (1), Internet use is the only right-hand side variable. In column (2), province-fixed effects are added and in column (3) both province-fixed effects and covariates are controlled. In both cases, *Internet use* has a significant and positive effect on optimism, which support our hypothesis H1. The result of column (3) suggests that the difference in optimism between residents who use the Internet and those who do not is 0.322 after controlling province fixed effects (FE) and covariates, which is translated into a marginal effect of 1.5% when evaluated at the mean of 21.35.

T A B L E 1 The impact of Internet use on optimism

	(1)	(2)	(3)
Internet use	0.71* (7.22)	0.61* (6.12)	0.32* (2.29)
Constant	20.93* (276.52)	21.17* (118.58)	19.84* (45.37)
Province FE	No	Yes	Yes
Controls	No	No	Yes
Observations	3951	3951	3799
Adjusted R^2	0.013	0.035	0.053

Notes: Robust t-statistics are given in parentheses; * indicates statistical significance at 5%.

T A B L E 2 The impact of the level of Internet use on optimism

	(1)	(2)	(3)	(4)
Frequency of Internet use (Compared to "Never using the Internet")				
Rare	0.25 (1.20)	0.21 (0.96)		
Sometimes	0.06 (0.33)	-0.09 (-0.4)		
Often	0.60* (4.72)	0.38*(2.30)		
Always	1.06* (8.85)	0.79* (4.52)		
Daily online time (logged)			0.16* (7.73)	0.07* (2.37)
Province FE	No	Yes	No	Yes
Controls	No	Yes	No	Yes
Observations	3952	3801	3831	3689
Adjusted R^2	0.021	0.057	0.015	0.056

Notes: Robust t-statistics are given in parentheses; * indicates statistical significance at 1%.

The Level of Internet Use and Optimism

We present our OLS estimates derived from equations (2) and (3) in Table 2. In columns (1) and (2), we report the results that how the frequency of Internet use affects optimism, where in column (1) the only right-hand side variable is the dummy variable of *frequency of Internet use* and in column (2) we add province fixed effects and further control covariates. From these results, we can see that *often* and *always* using the Internet both predict a significant increase in optimism and the effect of *always* using the Internet is somewhat larger than *often* using the Internet, which supports hypothesis H2a. In columns (3) and (4), we report the results of the impact of *daily online time (logged)* on optimism. Similarly, no matter whether we control province-fixed effects and covariates or not, *daily online time* (logged) has a positive and significant effect on optimism, which supports hypothesis H2b.

Endogenous Discussions

There may be a reverse causality between Internet use and optimism. For example, more optimistic people are more likely to use problem-solving and support-seeking coping strategies [15]. Therefore, optimists may have a higher possibility to try to use the Internet as a tool to solve some specific problems. In addition, omitted variables problem may also cause a bias in the estimation coefficient of our baseline model. Here, we use the instrumental variable (IV) to eliminate the effect of endogeneity based on the two-stage least squares (2SLS) approach. *Internet penetration rate* is selected as the IV of whether to use the Internet. On the one hand, the Internet penetration rate reflects the average network status in a specific district, which is exogenous since the impact of any single individual's action on the average network status is neglectable. On the other hand, average network status may affect individuals' decisions on Internet use. Therefore, the Internet penetration rate satisfies both the exogeneity and relevance conditions of IV. The data on the Internet penetration rate comes from the National Bureau of Statistics of China. (Data resourse: https://data.stats.gov.cn/easyquery.htm?cn=E0103)

We report the instrumented results in Table 3. In column (1), we present the estimation of the impact of Internet use on optimism under the 2SLS approach. The impact of Internet use on optimism is positive and significant, which again supports hypothesis H1. The instrumented result suggests that using the Internet leads to a 13% increase in optimism when evaluated at the mean of 21.35. Since optimism is relatively stable, this magnitude of the effect is non-negligible.

T A B L E 3 Endogenous Discussion

	(1)	(2)	(3)
Internet use	2.86* (2.24)		
Frequency of Internet use		0.77* (2.33)	
Daily online time (logged)			0.74* (2.25)
Constant	17.56* (15.6)	17.05* (13.2)	17.71* (16.7)
Controls	Yes	Yes	Yes
Observations	3799	3801	3689

Notes: Robust t-statistics are given in parentheses; * indicates statistical significance at 5%.

Endogeneity bias may also exist in our extended model for a similar reason. Therefore, we also use the *Internet penetration rate* as IV and re-estimate the extended model with the 2SLS approach. The results are reported in column (2) and column (3) where independent variables are *frequency of Internet use* and *daily online time*, respectively. All these results suggest that the impact of the level of Internet use is positive and significant, which supports H2a and H2b.

Robustness Checks

Alternative model

First, we use Quantile Regression (QR) method to test whether our baseline estimates are robust. This method is not susceptible to extreme values and is more robust than mean regression. Column (1) in Table 4 reports the result of median regression where the independent variable is *Internet use*. Columns (2) – (4) report the results of IV Quantile Regression [26] for quantiles equal to 0.2, 0.5, and 0.8 respectively, where the independent variable is *Internet use* and IV is *Internet penetration rate*. Figure 2 shows the results of IV Quantile

Regression for quantiles equal to 0.1 to 0.9 (Interval = 0.1), where the independent variables are *Internet use*, *frequency of Internet use*, *daily online time* (logged), and *daily online time*, respectively.

T A B L E 4 The results of Quantile Regression

	(1) QR	(2) IVQR	(3) IVQR	(4) IVQR
Internet use	0.44* (2.51)	2.87* (2.04)	2.91* (2.06)	2.95* (1.69)
Constant	19.87* (36.44)	14.99* (13.00)	17.67* (14.30)	20.02* (20.02)
Controls	Yes	Yes	Yes	Yes
Province FE	Yes	No	No	No
Observations	3799	3799	3799	3799

Notes: Robust t-statistics are given in parentheses for column (1) and t-statistics of the program are given in parentheses for columns (2), (3), and (4); * indicates statistical significance at 1%.

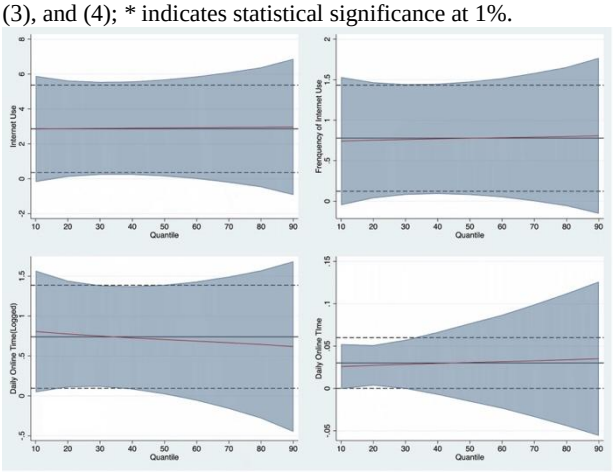

FIGURE2. The result of Quantile Regression

Notes: Solid broken lines represent the coefficients of the independent variable under IV Quantile Regression with quantiles equal to 0.1 to 0.9 (interval =0.1) and shaded areas represent their 95% confidence interval (calculate by the default method of the program); Long dashed lines represent the coefficients of the independent variable under 2SLS method and short dashed lines represent their 95% confidence interval; *Frequency of Internet use* is treated as a continuous variable; IV is *Internet penetration rate*.

From column (1) of Table 4, we can see that the impact of Internet use on optimism's median is significant (at the 5% level) and positive. After considering endogeneity bias, the impact of Internet use on optimism's 0.2 and 0.5 quantiles are significant at the 5% level and the impact on optimism's 0.8 quantiles is significant at the 10% level, which supports that the impact of Internet use on optimism is robust. Figure 2 shows that the impact of *Internet use* on optimism's 0.2, 0.3, 0.4, and 0.5 quantiles are significant at the 5% level; the impact of *frequency of Internet use* on optimism's 0.2, 0.3, 0.4, 0.5 and 0.6 quantiles are significant at the 5% level; the impact of *daily online time* on optimism's 0.2 and 0.3 quantiles are significant at the 5% level. Generally, the impact of *Internet use* on optimism' mean is close to the impact of Internet use on optimism's different quantiles, which also indicates that the impact of Internet use on optimism is robust.

T A B L E 5 Results with the hope being the dependent variable

	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS
Internet use	1.05* (3.04)			8.16* (2.86)
Frequency of Internet use (compared to "Never using the Internet")				
Rare		0.56 (1.01)		
Sometimes		0.10 (0.22)		
Often		1.57* (3.82)		
Always		1.86* (4.30)		
Daily online time (logged)			0.28* (3.84)	
Constant	26.86* (25.2)	26.31* (24.7)	27.02* (25.5)	19.32* (7.62)
Controls	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	-
Observations	3591	3594	3484	3591
Adjusted R^2	0.142	0.145	0.143	0.025

Notes: Robust t-statistics are given in parentheses; * indicates statistical significance at 1%.

Alternative dependent variable

There is no other question that measures optimism directly in CGSS2017. However, question D39 in CGSS2017 provides Adult Hope Scale (AHS) [27]. The hope scale is an 8-point Likert scale that contains 6 items, and the overall-hope score is computed by summing up all items. Higher the overall score, the higher one's hope level. Hope can be defined as "a cognitive set that is based on a reciprocally derived sense of successful (a) agency (goal-directed determination) and (b) pathways (planning of ways to meet goals)." In the field of positive psychology, hope is treated as a concept that is closely related to optimism, which also reflects positive expectations for the future [28,29]. In addition, hope and optimism are often treated as parts of psychological capital and are studied together [30]. Therefore, optimism is replaced by hope to test the robustness here. In Table 5, columns (1), (2), and (3) report the results under the OLS method, where the independent variables are *Internet use*, *frequency of Internet use*, and *daily online time* (logged), respectively. Column (4) reports the result under the 2SLS method, where the independent variable is *Internet use* and IV is *Internet penetration rate*.

From these results, we can see that under the OLS method, *Internet use*, *often* and *always use the Internet*, and *daily online time (logged)* both have significant (at the 1% level) and positive impacts on hope. Under the 2SLS method, the impact of *Internet use* on hope is also significant (at the 1% level) and positive, which supports that our results are relatively robust.

Alternative independent variables

In addition to *Internet use*, *frequency of Internet use*, and *daily online time*, CGSS2017 also asks whether people use the

Internet as the main source of information and the frequency of Internet use in people's spare time. Thus, we use these variables to replace independent variables and check the robustness of our results.

Column (1) in Table 6 indicates that under the OLS method, the other individuals have a significantly lower level of optimism than those who use the Internet in their spare time daily. Column (2) indicates that under the 2SLS method, individuals who never use the Internet in their spare time have a significantly lower level of optimism than other people. Column (3) and (4) shows that taking the Internet as the main source of information has a significant and positive effect on optimism. In summary, these results indicate that the impact of Internet use on optimism is robust.

T A B L E 6 The impact of alternative variables on optimism

	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS
Internet use in spare time (compared to "Daily")				
Several times a week	-0.43* (-2.59)			
Several times a month	-0.71* (-2.85)			
Several times a year or less	-1.18* (-3.33)			
Never	-0.70* (-4.59)			
Never use the Internet in your spare time		-3.54* (-2.24)		
Take the Internet as the main source of information			0.56* (4.09)	5.28* (2.01)
Constant	20.23* (48.82)	20.62* (45.35)	19.65* (45.47)	15.32* (6.57)
Province FE	Yes	No	Yes	No
Controls	Yes	Yes	Yes	Yes
Observations	3800	3803	3737	3737
Adjusted R^2	0.059	-	0.053	-

Notes: Robust t-statistics are given in parentheses; * indicates statistical significance at 5%; IV in columns (2) and (4) is the *Internet penetration rate*.

Mechanisms

Confidence in social development

According to our assumption, Internet use has a positive effect on optimism because Internet media spread more positive information than negative information, thus improving people's confidence in social development. Having confidence in social development, individuals who live in society may also have a better expectation about their own future. To verify our assumption, we need to test two preconditions. First, we need to prove that Internet media in China spread more positive information than negative information. A detailed discussion about this topic is beyond the scope of this paper. However, considering that China's media system is under governmental control greatly [31], and the social background of China's rapid economic and social development in recent decades [32] (which provides many raw materials for positive information on the Internet media), it's reasonable to assert that Internet media in China spread more positive information. In addition, since the Internet is the product of technological development, using this new technology may also help individuals to feel social progress directly and thus become more optimistic about the future.

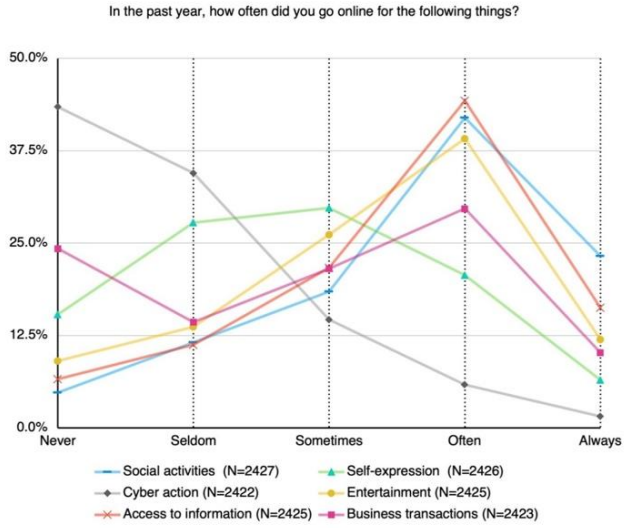

FIGURE 3. Frequency of different Internet uses

Notes: Specifically, social activities include using emails and social software such as QQ and WeChat to contact people; self-expression includes recording and sharing one's feelings by posting WeChat Moments, tweeting, and so on; cyber action includes defending one's rights, advocating for others, and so on through the Internet; entertainment includes gaming, watching videos, listening to music, and so on; access to information includes searching information, browsing the news, and so on; business transactions include transferring money through the Internet, electronic payment, online shopping, and so on.

Second, considering that the Internet has different uses, we need to prove that acquiring information is one of the main uses of the Internet. Question C42 in CGSS2017: "In *the last year, how often did you go online for the following things (social activities, self-expression, cyber action, entertainment, access to information, business transactions)?*" sheds light on this concern. The option under the question is a 5-point Likert scale ("*Never*", "*Seldom*", "*Sometimes*", "*Often*", and "*Always*"). Figure 3 shows the answers to question C42. Though we could not use the regression method to test the impact of different Internet uses on optimism directly since the samples of the C module and D module are not overlapped, from the figure, we can see that access to information is one of the main uses of Internet, which supports our second precondition.

We use question D4016 in CGSS2017: "How *much do you agree with the following statement: I feel very confident about the development of society*" to measure residents' confidence in social development. The option under the question is a 6-point Likert scale ("*Strongly Disagree*", "*Disagree*",

"*Somewhat Disagree*", "*Somewhat Agree*", "*Agree*", "*Strongly Agree*"). Considering the possible endogeneity bias, we use the 2SLS method to estimate the impact of Internet use on confidence in social development, where IV is the *Internet penetration rate* (by province).

T A B L E 7 The impact of Internet use on confidence in social development

	(1)	(2)	(3)
Internet use	1.02* (2.45)		
Frequency of Internet use		0.27* (2.44)	
Daily online time (logged)			0.20* (2.34)
Constant	3.12* (8.79)	2.97* (7.10)	3.34* (11.86)
Controls	Yes	Yes	Yes
Observations	3878	3881	3868

Notes: Robust t-statistics are given in parentheses; * indicates statistical significance at 5%.

Table 7 presents the results. In Column (1), the independent variable is *Internet use*, and we can see that *Internet use* has a significant (at the 5% level) and positive impact on confidence in social development, which supports our hypothesis H3a. In Columns (2) and (3), the independent variables are *frequency of Internet use* and *daily online time* (logged), respectively and we can find that the level of Internet use also has a significant and positive impact on confidence in social development.

Social resources

Apart from affecting one's expectation about his own future through changing his attitude towards social development, Internet use may also affect optimism by changing the resources that one possesses. Social resources (including social networks and social support) may have a positive impact on optimism [11,23,33]. One example is, more friendships may portend more potential celebrations [11]. Sociality is one of the important uses of Internet media[31] and Figure 3 also proves that in our samples, many people use the Internet to socialize. Thus, a plausible hypothesis is people accumulate social resources by using the Internet to socialize and therefore improve their level of optimism. Specifically, we evaluate the impact of Internet use on social resources through two methods.

First is descriptive statistics. Figure 4 below shows the impact of Internet use on interpersonal intimacy. The data comes from question C45 in CGSS2017: "how *much has the Internet changed your interaction with these people (who share the same hobbies, who share the same political views, who share the same religious belief, family members, friends, colleagues).*" The options under the question are "*closer*", "*close*", "*no change*", "*alienate*", and "*more alienate*". We can see that, for most people in our samples, Internet use improves or at least doesn't change one's interpersonal intimacy with the six types of people above, which directly supports that Internet use helps the accumulation of social resources.

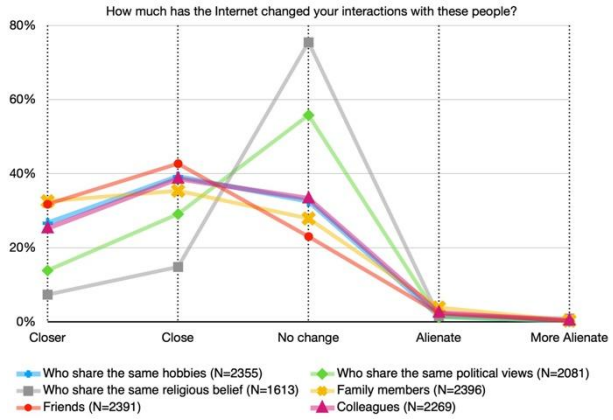

FIGURE 4. The impact of Internet use on interpersonal intimacy

Then, we use the regression method to examine the impact of Internet use on social resources. We use questions C22, C23, C24, C25, and C26, in CGSS2017: "Please think about the parent (sibling, adult child, other family member, friend) you have contact with most frequently: How often do you contact with that parent (sibling, adult child, other family member, friend)?" to measure social resources. These questions also come from the social network and social resource module of the International Social Survey Program in 2017 (ISSP2017), which are used to measure sociability in kinship and friendship networks [34]. The options under the questions are "*Daily*", "*Several times a week*", "*Once a week*", "*Two or three times a month*", "*Once a month*", "*Several times a year*", "*Rarely*", and "*Never*". Since these measures of social resources are ordered variables, we use Ordered Logit (Ologit) methods to regress them on Internet use. The results are reported in Table 8 below.

T A B L E 8 The impact of Internet use on the frequency of contact

	(1) Parent	(2) Sibling	(3) Adult child	(4) Other family member	(5) Friend
Internet use	-0.01 (-0.06)	0.41* (4.47)	0.33* (3.19)	0.350* (3.55)	0.65* (6.92)
Controls	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes
Obs	1888	3312	2155	3157	3411
Pseudo R^2	0.032	0.048	0.042	0.011	0.035

Notes: Robust t-statistics are given in parentheses; * indicates statistical significance at 5%.

In columns (2) to (5), the impact of Internet use on the frequency of contact with a sibling, adult child, other family member, or friend, is significant and positive, which supports hypothesis H3b. However, in column (1), the impact of Internet use on the frequency of contact with a parent (who contacts with most frequently) is not significant. We ascribe this result to low Internet access among the elderly.

Physical health

Health conditions may also affect optimism [24]. Thus, it's natural to suppose that gaining health-related information from the Internet may reduce one's health risks or improve one's health condition and therefore makes people more optimistic. To test this hypothesis, we use question A15: "*What do you think is your current physical condition*?" and question A16: "*In the past four weeks, how often have health problems*

affected your work and other daily activities?" in CGSS2017 to measure physical health condition. The options for question A15 are "*Very Unhealthy*", "*Relatively Unhealthy*", "*Normal*", "*Relatively healthy*", and "*Very Healthy*" and the options for question A16 are "*Always*", "*Often*", "*Sometimes*", "*Seldom*", and "*Never*". Since both two variables are ordered variables, we use Ologit and Bioprobit methods (which solves endogeneity bias) to estimate the impact of Internet use on physical health conditions.

T A B L E 9 The impact of Internet use on the physical health condition

	(1) Ologit	(2) Bioprobit	(3) Ologit	(4) Bioprobit
Internet use	0.33* (6.56)	0.29* (4.62)	0.32* (6.27)	0.68* (11.40)
athrho		-0.06* (-1.74)		-0.29* (-7.65)
Controls	Yes	Yes	Yes	Yes
Province FE	Yes	No	Yes	No
Observations	12117	12117	12123	12123
Pseudo R^2	0.086	-	0.089	-

Notes: Robust t-statistics are given in parentheses; * indicates statistical significance at 5%. IV in columns (2) and (4) is the *Internet penetration rate*.

Table 9 reports the results, where the dependent variable is self-reported physical health status in column (1) and (2) and the frequency of experiences that health problem affects work and other daily activities in column (3) and (4). These results support that Internet use has a significant and positive effect on self-reported physical health status and can significantly reduce the frequency of experiences that health problem affects work and other activities, which verifies hypothesis H3c.

CONCLUSIONS

In this paper, we use CGSS2017 data to identify the causal effect of Internet use on individuals' optimism. The results of the empirical study support our hypothesis that Internet use and the level of Internet use have a positive and robust effect on optimism. We find that Internet use has a positive effect on confidence in social development, social recourses, and physical health condition, which indicates that Internet use positively affects optimism through three channels: enhancing confidence in social development, enriching social recourses, and improving physical health condition.

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R E F E R E N C E S

[1] Scheier, MF and Carver, CS: Optimism, coping, and health: assessment and implications of generalized outcome expectancies. Health Psychology 1985; 4, 219-247. doi:10.1037//0278-6133.4.3.219

[2] Scheier, MF, Carver, CS and Bridges, MW: Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): a reevaluation of the Life Orientation Test. J Pers Soc Psychol 1994; 67, 1063-1078. doi:10.1037/0022-3514.67.6.1063

[3] Scheier, MF, Weintraub, JK and Carver, CS: Coping with stress: divergent strategies of optimists and pessimists. J Pers Soc Psychol 1986; 51, 1257-1264. doi:10.1037//0022-3514.51.6.1257

[4] Carver, CS and Scheier, MF: Dispositional optimism. Trends in Cognitive Sciences 2014; 18, 293-299. doi:10.1016/j.tics.2014.02.003

[5] Carver, CS, Scheier, MF and Segerstrom, SC: Optimism. Clinical Psychology Review 2010; 30, 879-889. doi:10.1016/j.cpr.2010.01.006

[6] Forgeard, MJC and Seligman, MEP: Seeing the glass half full: A review of the causes and consequences of optimism. Pratiques Psychologiques 2012; 18, 107-120. doi:10.1016/j.prps.2012.02.002

[7] Isaacowitz, DM: Correlates of well-being in adulthood and old age: A tale of two optimisms. Journal of Research in Personality 2005; 39, 224-244.

[8] Arslan, G, Yildirim, M, Tanhan, A, Bulus, M and Allen, KA: Coronavirus Stress, Optimism-Pessimism, Psychological Inflexibility, and Psychological Health: Psychometric Properties of the Coronavirus Stress Measure. International Journal of Mental Health and Addiction 2021; 19, 2423-2439. doi:10.1007/s11469-020-00337-6

[9] Jovancevic, A and Milicevic, N: Optimism-pessimism, conspiracy theories and general trust as factors contributing to COVID-19 related behavior - A cross-cultural study. Personality and Individual Differences 2020; 167. doi:10.1016/j.paid.2020.110216

[10] Chopik, WJ, Oh, J, Kim, ES, Schwaba, T, Kramer, MD, Richter, D and Smith, J: Changes in optimism and pessimism in response to life events: Evidence from three large panel studies. Journal of Research in Personality 2020; 88. doi:10.1016/j.jrp.2020.103985

[11] Segerstrom, SC: Optimism and resources: Effects on each other and on health over 10 years. Journal of Research in Personality 2007; 41, 772-786. doi:10.1016/j.jrp.2006.09.004

[12] Baranski, E, Sweeny, K, Gardiner, G, Funder, DC and Int Situations, P: International optimism: Correlates and consequences of dispositional optimism across 61 countries. Journal of Personality 2021; 89, 288-304. doi:10.1111/jopy.12582

[13] Gallagher, MW, Lopez, SJ and Pressman, SD: Optimism Is Universal: Exploring the Presence and Benefits of Optimism in a Representative Sample of the World. Journal of Personality 2013; 81, 429-440.

[14] Gordeeva, TO, Sychev, OA and Semenov, YI: Constructive Optimism, Defensive Optimism, and Gender as Predictors of Autonomous Motivation to Follow Stay-at-Home Recommendations during the COVID-19 Pandemic. Psychology in Russia-State of the Art 2020; 13, 38-54. doi:10.11621/pir.2020.0403

[15] Mens, MG, Scheier, MF and Carver, CS Optimism. In: Oxford handbook of positive psychology 2021, Oxford University Press

[16] Meevissen, YMC, Peters, ML and Alberts, HJEM: Become more optimistic by imagining a best possible self: Effects of a two week intervention. Journal of Behavior Therapy and Experimental Psychiatry 2011; 42, 371-378. doi:10.1016/j.jbtep.2011.02.012

[17] Bradshaw, M and Kent, BV: Prayer, Attachment to God, and Changes in Psychological Well-Being in Later Life. Journal of Aging and Health 2018; 30, 667-691. doi:10.1177/0898264316688116

[18] Peterson, C and Steen, T Optimistic explanatory style. In: Oxford handbook of positive psychology 2021, Oxford University Press

[19] Peterson, C: The future of optimism. American Psychologist 2000; 55, 44-55. doi:10.1037/0003-066x.55.1.44

[20] Croteau, DR and Hoynes, WD Media/Society: Industries, Images, and Audiences, Fifth Edition 2013, SAGE Publications

[21] Pe'er, A and Slone, M: Media Exposure to Armed Conflict: Dispositional Optimism and Self-Mastery Moderate Distress and Post-Traumatic Symptoms among Adolescents. International Journal of Environmental Research and Public Health 2022; 19, 11216. doi:10.3390/ijerph191811216

[22] Eden, A, Johnson, B, Reinecke, L and Grady, S: Media for Coping During COVID-19 Social Distancing: Stress, Anxiety, and Psychological Well-Being. Frontiers in Psychology 2020; 11. doi:10.3389/fpsyg.2020.577639

[23] Symister, P and Friend, R: The influence of social support and problematic support on optimism and depression in chronic illness: A prospective study evaluating self-esteem as a mediator. Health Psychology 2003; 22, 123-129. doi:10.1037/0278-6133.22.2.123

[24] Tomberg, T, Toomela, A, Ennok, M and Tikk, A: Changes in coping strategies, social support, optimism and health-related quality of life following traumatic brain injury: A longitudinal study. Brain injury: [BI] 2007; 21, 479-488. doi:10.1080/02699050701311737

[25] Gallagher, MW and Lopez, SJ Positive Psychological Assessment: A Handbook of Models and Measures 2019, American Psychological Association.

[26] Machado, JAF and Silva, J: Quantiles via moments. Journal of Econometrics 2019; 213, 145-173. doi:10.1016/j.jeconom.2019.04.009

[27] Snyder, CR, Harris, C, Anderson, JR, Holleran, SA and Al, E: The will and the ways: development and validation of an individual-differences measure of hope. Journal of Personality & Social Psychology 1991; 60, 570-585.

[28] Bryant, FB and Cvengros, JA: Distinguishing Hope and Optimism: Two Sides of a Coin, or Two Separate Coins? Journal of Social and Clinical Psychology 2004; 23, 273-302.

[29] Fowler, D, Weber, EN, Klappa, SP and Miller, SA: Replicating future orientation: Investigating the constructs of hope and optimism and their subscales through replication and expansion. Personality and Individual Differences 2017; 116, 22-28.

[30] Luthans, F and Youssef-Morgan, CM Psychological Capital: An Evidence-Based Positive Approach. In Annual Review of Organizational Psychology and Organizational Behavior, Vol 4 (Morgeson, F.P., ed), 2017 pp. 339-366.

[31] Schroeder, R Social Theory after the Internet: Media, Technology, and Globalization 2018, UCL Press.

[32] Zhu, XD: Understanding China's Growth: Past, Present, and Future. Journal of Economic Perspectives 2012; 26, 103-124. doi:10.1257/jep.26.4.103

[33] Orejudo, S, Puyuelo, M, Fernández-Turrado, T and Ramos, T: Optimism in adolescence: A cross-sectional study of the influence of family and peer group variables on junior high school students. Personality and Individual Differences 2012; 52, 812-817. doi:10.1016/j.paid.2012.01.012

[34] Sapin, M, Joye, D and Wolf, C: The ISSP 2017 social networks and social resources module. International Journal of Sociology 2020; 50, 1-25.doi:10.1080/00207659.2020.1712