

# The Influence of WI-FI Use on the Resilience in Undergraduates

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**Abstract**—The objective of this paper is to explore the resilience and the WI-FI behavior in the undergraduates, and investigate the relationship between them. One thousand one hundred and seventy-four undergraduates who were selected by stratified random sampling from 5 universities in Guangdong were assessed with the Resiliency Scale for Chinese Adolescent (RSCA), as well as a self-edited questionnaire on the general information and the WI-FI behavior in the undergraduates. Results included the following: (1) the resilience of the undergraduates was at the middle level; (2) the undergraduates didn't have enough scientific knowledge on WI-FI, 80.32% of them were high-frequent user of WI-FI, and 17.12% of them were WI-FI dependents; (3) there existed commonly some physical sub-health symptoms in the undergraduates, such as numbness and soreness of cervical or lumbar vertebra, dry eyes and even pain, and impaired vision; (4) multiple regression analysis showed that the mainly influencing factors in terms of WI-FI use of the total score of RSCA were the following 11 items: the knowledge of WI-FI, the purpose of Internet access (whether to use WI-FI to escape the real troubles), the degree of WI-FI dependence, whether the undergraduates were anxious to use WI-FI in the public place, the average time of WI-FI use per day, degree of shoulder and neck involvement, degree of eye involvement, degree of lumbar involvement, whether free WI-FI software was installed or not, whether to use WI-FI during class, whether the personal mobile phone supporting WI-FI. In conclusion, the use of WI-FI had significant influence on the resilience in the undergraduates.

**Keywords**—*WI-FI, resilience, undergraduates*

## I. INTRODUCTION

Resilience is an important indicator of mental health and plays an important role in the process of mental

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adaptation [1-2], can negatively predict psychological problems such as subjective stress, anxiety and depression, and positively predict quality of life [3-7]. From the perspective of the formation mechanism, resilience is the adaptation process in which an individual realizes good adaptation through reasonable response in the face of setbacks or stressful events. The influencing factors of resilience are divided into risk factors and protective factors. Risk factors include adversity and stress, and protective factors include family protection, social protection and personal protection [8]. Most studies in China on the influencing factors of undergraduates' resilience focus on protective factors, such as social support, reasonable cognition, achievement motivation, will quality, personality trait, active behavior, etc. [5,9-10], and studies on risk factors are limited.

Undergraduates' dependence on WI-FI is becoming increasingly obvious [11-15], and more than 80% of undergraduates are high-frequency users of WI-FI [11]. Studies showed that the high frequency use of the network has a wide negative impact on the mental health of undergraduates, manifested as cognitive narrowness, distortion, mood swings (easy to feel lonely, depressed, anxious, sensitive, hyperactive, etc.), social barriers, uncontrollable behaviors and personality changes [14-15]. However, most of the previous studies focused on analyzing the correlation between the use of wired networks and mental health. Although it can be showed that there is a certain relationship between the two, they fails to explain whether it is a direct correlation or a covariation relationship, it is even more difficult to explain which factors affect the mental health in the use of Internet. As for the impact of WI-FI, a special network environment related to undergraduates closely, on mental health, only a few descriptive studies were conducted, and the impact of WI-FI on undergraduates' resilience has not been reported.

Positive psychology believes that daily life events can also affect an individual's resilience without suffering setbacks or adverse situations [16]. Then, does the use of

WI-FI, which has a wide impact on the life of undergraduates, have an impact on the resilience of undergraduates? What are the main influencing factors? This study aims to offer the answer to this question.

## II. OBJECT AND METHOD

### A. Object

1,300 undergraduates from five universities including Guangdong Finance College, Guangzhou College of South China University of Technology, Guangdong University of Technology, Guangdong Medical University and Dongguan College of Technology were selected by stratified random sampling (the first three with full WI-FI coverage, and the last two with partial WI-FI coverage), and 1174 copies of valid questionnaires were collected, the effective rate was 90.3%. There are 541 male students and 633 female students, 699 urban students, 216 students from rural-urban fringe zone, 259 rural students, 240 students majored in science, 392 students majored in engineering, 511 students majored in liberal arts, and 31 students majored in art, 162 students with excellent academic performance, 397 students with good academic performance, 122 students with moderate academic performance and 45 students with poor academic performance, 70 students from wealthy families, 530 students from well-off families, 516 students from average families and 58 students from poor families.

### B. Tools

#### 1) Resilience Scale for Chinese Adolescent (RSCA) [17]

Prepared by Hu Yueqin, RSCA is a self-rating scale. There are 27 items, which are divided into two second-order factors: personal strength and support. The personal strength includes three third-order factors: target concentration, emotional control and positive cognition. Support includes two third-order factors: family support and interpersonal assistance. The scale was scored by the Likert five dimensions scale, the score for "completely non-conforming" to "fully conforming" is rated as 1 to 5 points respectively. The higher the score is, the higher the resilience is. In this study, the Cronbach's a coefficient of the total scale was 0.88, and the Cronbach's a coefficient of each factor was 0.74 to 0.82. The test-retest reliability of the total scale at one-month interval was 0.87, and the test-retest reliability of each factor at one-month interval was 0.75-0.83.

#### 2) Self-edited personal general survey

This survey contains eight items including gender, age, grade, place of residence, school, major, class ranking, and family economic status.

#### 3) Self-edited WI-FI use survey

This survey contains 19 items including the knowledge of WI-FI, the most attractive part of WI-FI, whether the personal mobile phone supporting WI-FI access, main tool for WI-FI access, whether to use WI-FI during class, the primary place to use WI-FI, main time period using WI-FI, and the average time of WI-FI use per day, frequency of

WI-FI access per day, what do you mainly do with WI-FI, and whether the WI-FI signal transmitter is installed in the dormitory. Whether the PC is equipped with free WI-FI software, whether the undergraduates were anxious to use WI-FI in the public place, the degree of neck and shoulder involvement, the degree of lumbar involvement, the degree of eye involvement, the degree of mental dependence on WI-FI, whether to use WI-FI as a way to escape problems or alleviate bad feelings, and the reasons for addiction to WI-FI use among undergraduates.

### C. Data processing

The data was processed using SPSS20.0. The processing methods included descriptive statistics, independent sample t-test, one-way analysis of variance (ANOVA), multiple linear regression, and so on.

## III. RESULTS

### A. The use of WI-FI by undergraduates in this group

All students in this group use WI-FI every day. WI-FI is their main access to internet, 92.8% of students have a certain understanding of WI-FI, but 66.3% of students do not know much, 95.2% of students use WI-FI for convenience and economy, 95.1% of personal mobile phones support WI-FI function, 32.6% of students never use WI-FI during class, 81.4% of students use smart phones as the main tool for using WI-FI, 72.8% The students used the dormitory as the primary place to go online, 75.1% of the student dormitories are installed with WI-FI signal transmitters, 55.3% of the PCs are equipped with free WI-FI software, 51.5% of students were eager to use WI-FI in public places, 63.0% of students mainly go online at night, 80.3% of students use WI-FI more than 3 hours per day, 67.3% of students connect to WI-FI more than 3 times a day, 86.9% of students go online mainly to play games, chat, watch the film, 45.9% of students constantly devote more time and attention to using WI-FI in order to achieve some kind of pleasure, 38.0% of students often reduce other after-school interests for using WI-FI, 78.2% of students think that WI-FI use takes up physical exercise time, 52.6% of students believe that WI-FI use affects physical and mental health, 83.6% of students believe that doing sports can help overcome WI-FI addiction, 40.8% of students use WI-FI as a way to evade troubles and alleviate bad feelings, 17.1% of students have a heavy dependence on WI-FI.

### B. The health status of the students in this group

76.4% of the students had obvious fatigue in the neck, 66.0% of the students had stiff or even painful lumbar vertebrae, 47.2% of the students had dry eyes and even sore eyes, and 55.7% of the students had significantly decreased vision.

### C. Gender differences in RSCA scores

It can be seen from Table 1 that boys scored higher than girls in terms of emotional control and interpersonal assistance, and scored lower than girls on positive cognitive and family support, such difference was statistically significant ( $P < .01$ ).

**TABLE I. COMPARISON OF RSCA SCORES BETWEEN MALE AND FEMALE UNDERGRADUATES**

	<b>Boys (n=539)</b>	<b>Girls (n=625)</b>	<i>t</i>	<i>P</i>
	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>		
Total score	93.06±14.75	92.46±17.81	1.670	.082
Target concentration	17.42±4.46	17.12±5.05	1.418	.103
Emotional control	19.10±4.15	17.82±5.41	4.560	<.001
Positive cognition	15.89±4.17	16.82±5.11	-3.421	.001
Family support	22.11±3.27	22.77±3.90	-3.177	.002
Interpersonal assistance	18.54±3.22	17.93±3.86	2.946	.006

**TABLE II. VARIABLE ASSIGNMENT OF WI-FI USE**

<b>Items</b>	<b>Options and assignments</b>
1. Main time period using WI-FI	1=morning, 2=noon, 3=afternoon, 4=evening
2. The most attractive part of WI-FI	1=convenience, 2=economy, 3=security
3. Whether the personal mobile phone supporting WI-FI	1=no, 2=yes
4. The main tool for WI-FI access	1=Smartphone, 2=ipad, 3=laptop, 4=desktop
5. The primary place to use WI-FI	1=class room, 2=library, 3=dormitory, 4=other public places
6. Whether to use WI-FI during class	1=no, 2=yes
7. The average time of WI-FI use per day	1=0-2h, 2=3-4h, 3=5-6h, 4=7h or more
8. The knowledge of WI-FI	1=no understanding, 2=basic understanding, 3=good understanding
9. Frequency of WI-FI access per day	1=one time, 2=two times, 3=three times, 4=more than 3 times
10. What do you mainly do with WI-FI	1=play games, 2=chat or make friends, 3=entertainment, 4=news information, 5=learn and work, 6=other
11. Whether the WI-FI signal transmitter is installed in the dormitory	1=no, 2=yes
12. Whether the PC is equipped with free WI-FI software	1=no, 2=yes
13. Whether the undergraduates were anxious to use WI-FI in the public place	1=no, 2=yes
14. The degree of neck and shoulder involvement	1=no, no feeling, 2=Yes, some fatigue, 3=Yes, the neck is very uncomfortable
15. The degree of lumbar involvement	1=No, no effect, 2=Yes, feel very stiff in waist, 3=Yes, already painful
16. The degree of eye involvement	1=As usual, 2=slight discomfort, 3=dry eyes, 4=sore eyes
17. The degree of mental dependence on WI-FI	1=No, no dependence, 2=rare, 3=Yes, very strong
18. WI-FI access to escape problems or alleviate bad feelings	1=never, 2=rarely, 3=often, 4=always
19. The reasons for addiction to WI-FI use among undergraduates	1=poor self-control, 2=family disharmony, 3=high learning pressure, 4=bad social atmosphere, plus loose management in net cafe, 5=other, please specify
20. WI-FI does more good than harm or does more harm than good?	1=no impact, 2=advantages and disadvantages are equal, 3=the disadvantages outweigh the advantages, 4=the disadvantages outweigh the disadvantages
21. Effect of WI-FI use on vision	1=no effect, 2=significant decrease

**TABLE III. UNIVARIATE ANALYSIS OF WIFI USE AFFECTING RSCA TOTAL SCORE**

<b>Items</b>	<i>t/F</i>	<i>P value</i>
1. Main time period using WI-FI	-16.431	<.001
2. The most attractive part of WI-FI	0.127	0.881
3. Whether the personal mobile phone supporting WI-FI access?	3.55	0.001
4. The main tool for WI-FI access	-3.28	0.02
5. The primary place to use WI-FI	-5.38	0.001
6. Whether to use WI-FI during class?	19.063	<.001
7. The average time of WI-FI use per day	6.901	<.001
8. The knowledge of WI-FI	-16.071	<.001
9. Frequency of WI-FI access per day	-1.598	0.188
10. What do you mainly do with WI-FI	-1.1	0.355
11. Whether the WI-FI signal transmitter is installed in the dormitory	1.054	0.293
12. Whether the PC is equipped with free WI-FI software	3.345	0.001
13. Whether the undergraduates were anxious to use WI-FI in the public place	3.084	0.002
14. The degree of neck and shoulder involvement	27.352	<.001
15. The degree of lumbar involvement	31.967	<.001
16. The degree of eye involvement	34.602	<.001
17. The degree of vision loss	6.842	<.001
18. The degree of mental dependence on WI-FI	12.008	<.001
19. Whether to use WI-FI as a way to escape problems or alleviate bad feelings?	21.094	<.001
20. The reasons for addiction to WI-FI among undergraduates	-1.937	0.102
21. WI-FI use does more good than harm or does more harm than good?	5.806	0.001

*D. Univariate analysis of WI-FI use affecting the total score of RSCA*

*1) Variable assignment*

First, the possible cases (alternative answers) of the various WI-FI variables that may affect the RSCA total score are assigned. The results are shown in Table 2.

*2) Univariate analysis of WI-FI use affecting the total score of RSCA*

It can be seen from Table 3, except that five items including “the most attractive part of WI-FI”, “The number of times you connect to WI-FI every day”, “what do you mainly do with WI-FI”, “whether the WI-FI signal transmitter is installed in the dormitory” and “the reasons for addiction to WI-FI use among undergraduates” had no significant effect on the total score of RSCA, the remaining 14 items had significant effects on the total score of RSCA

( $P < .05$ ).

*3) Multiple Linear Regression Analysis of WI-FI Use Affecting the Total Score of RSCA*

Multiple linear regression analysis was performed with the total score of RSCA as the dependent variable, and the variables of the WIFI use as independent variables. At the level of  $P=0.05$ , the following 11 significant predictive factors were obtained: the knowledge of WI-FI, the purpose of Internet access (whether to use WI-FI to escape the real troubles), the degree of WI-FI dependence, whether the undergraduates were anxious to use WI-FI in the public place, the average time of WI-FI use per day, degree of shoulder and neck involvement, degree of eye involvement, degree of lumbar involvement, whether free WI-FI software is installed or not, whether to use WI-FI during class, whether the personal mobile phone supporting WI-FI. (See Table 4)

TABLE IV. MULTIPLE LINEAR REGRESSION ANALYSIS OF WI-FI USE STATUS AFFECTING RSCA TOTAL SCORE

	Non-standardized coefficient		Standardized coefficient			Correlation		
	<i>B</i>	<i>Standard error</i>	<i>Trial version</i>	<i>t value</i>	<i>P value</i>	<i>zero order</i>	<i>Partial</i>	<i>Part</i>
(Constant)	52.611	3.731	—	14.102	<.001	—	—	—
The degree of lumbar involvement	-3.058	0.817	0.121	3.743	<.001	-0.274	0.11	0.099
The knowledge of WI-FI	5.068	0.822	0.167	-6.166	<.001	0.157	-0.179	-0.164
The degree of eye involvement	-2.322	0.598	0.127	3.885	<.001	-0.27	-0.114	-0.103
The average time of WI-FI use per day	-3.286	0.823	0.108	3.994	<.001	-0.154	-0.117	-0.106
Whether the undergraduates were anxious to use WI-FI in the public place	-4.103	0.911	0.123	4.502	<.001	-0.09	-0.132	-0.119
WI-FI access to evade troubles	-2.081	0.574	0.104	3.626	<.001	-0.215	-0.106	-0.096
Use WI-FI during class	-1.421	0.504	0.08	2.818	0.005	-0.156	-0.083	-0.075
Degree of shoulder and neck involvement	-2.531	0.993	0.076	2.55	0.011	-0.194	-0.075	-0.068
The degree of WI-FI dependence	-4.632	1.995	0.063	2.322	0.02	-0.104	-0.068	-0.062
Whether the personal mobile phone supporting WI-FI	-1.094	0.46	0.064	2.376	0.018	-0.108	-0.07	-0.063
Whether free WI-FI software is installed or not	-1.914	0.926	-0.057	2.068	0.039	-0.096	-0.061	-0.055

IV. DISCUSSION

All undergraduates in this group use WI-FI every day. Among them, 80.3% use WI-FI more than 3 hours per day, belong to high-frequency network users [20], which is significantly higher than the period when WI-FI has not been popularized [19]. Among them, the incidence of Internet addiction was 17.1%, consistent with the results of Huang Hai and An Qian [15,18], which was higher than that of Bao Binggang and Lin Angui [21-22], this result may be related to the difference in sampling area. It is suggested that WI-FI use has become a major daily activity (especially after school) for undergraduates, and its main purpose is to play games, chat, watch movies and other entertainment activities [11-15].

The total score of RSCA for this group of students is  $92.76 \pm 16.62$  (out of 135), which is consistent with the research results of An Rong and Huang Shihua [5,9]. There was no significant difference in RSCA total score between boys and girls in this group, but the emotional control and

interpersonal assistance scores of boys were significantly higher than those of girls, and positive cognitive and family support scores were significantly lower than those of girls, which was inconsistent with Yang Xiaodan's research results [23], which may be caused by adoption of different sampling methods. The results of this study suggest that the resilience of undergraduates is moderate, and the effect of current growth environment on male and female undergraduates are generally equivalent effect. However, due to different physiological characteristics (for example, girls have a more pronounced cycle of emotional changes than boys), girls' emotional control is not as good as that of boys. Compared with girls, boys are more proactive and sociable, so they tend to have a wider network of contacts and higher interpersonal assistance scores. At the same time, due to different gender roles, families have stricter requirements for boys and are more focused on cultivating their independence, so their family support is lower than that of girls, in contrast to that, families pay more attention to cultivating girls' understanding and caring quality, so girls tend to look at the problem from a positive perspective,

so they score higher on the “positive cognition” factor than boys.

Multiple linear regression results showed that there were 11 WI-FI use factors affecting the total score of RSCA: understanding of WI-FI, the purpose of Internet access (whether to use WI-FI to escape the real troubles), the degree of WI-FI dependence, whether to use WI-FI during class, whether the undergraduates were anxious to use WI-FI in the public place, the average time of WI-FI use per day, the degree of shoulder and neck involvement, the degree of eye involvement, the degree of lumbar involvement, whether free WI-FI software is installed or not, and whether the personal mobile phone supporting WI-FI.

Understanding of WI-FI is a protective factor for resilience. According to Davis's cognition-behavior model [24], the psychological basis of irrational use of the network is the non-adaptive cognition of surfing the Internet. Internet technology, including WI-FI, has two sides [13]. On the one hand, it brings many benefits to individuals, such as broadening their horizons, increasing knowledge, expanding their circle of friends, and increasing self-confidence, on the other hand, the network (especially WI-FI) features such as virtuality, interactivity, real-time, and convenience are easy to make individuals form dependence, and have a negative impact on their lives and learning. A correct understanding of the two sides of WI-FI helps individual use WI-FI scientifically, effectively overcome the temptation of WI-FI, reasonably control network behavior, and cultivate good resilience.

This study found that mental dependence on WI-FI is a risk factor for resilience. Escaping real troubles is the most important reason for undergraduates to use WI-FI [25], and it is also a risk factor for resilience. Because, to a certain extent, the Internet can temporarily remove individuals from real problems and troubles, stopping using the Internet will make them have to revisit the real problems, making them see the Internet as the most effective and even the only way to reduce stress, and WI-FI availability (such as WI-FI full coverage, installation of free WI-FI software, personal mobile phone supporting WI-FI function, etc.) enables individuals to access the Internet anytime, anywhere [13], further contributing to the tendency to evade real-world problems. This in turn hinders individuals from facing reality and from trying to find solutions to problems, making the possibility of overcoming difficulties and recovering from setbacks even lower, therefore leading to lower resilience. Therefore, individuals can only gradually devote more time on the Internet, increase the opportunity to access the Internet, and even in some inappropriate places (such as classrooms, public places) and inappropriate time (during morning exercises, early reading, class or meeting), can not use Internet controllably, thus forming a mental dependence on WI-FI [24], the resilience is further reduced.

This group of undergraduates generally have somatic sub-health problems, including problems in neck, waist,

and vision, which is consistent with previous research results [11], suggesting that the high-frequency use of WI-FI is a common problem for undergraduates' physical health. At the same time, this study found that the somatic sub-health status is a negative predictor of the RSCA total score. Previous studies have shown that the high-frequency use of the network is closely related to the physiological and psychological sub-health of undergraduates [11,25]: the incidence of physiological and psychological sub-health of high-frequency network users is higher than that of normal network users. As the dependence on network increases, the incidence and severity of physical and psychological symptoms increase linearly, and the physical and psychological quality of individuals decreases [26]. This study also verified this point.

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