

## Research Article

# Smartphone Usage and Anxiety among College Students during Social Isolation for Covid-19 Epidemic in China

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## Abstract

**Background:** Social isolation has been reported to cause mental disorder and altered behaviors including mounting smartphone usage among college students during the Covid-19 lockdown.

**Objective:** The study aimed to investigate the profile of anxiety state and smartphone usage by self-reporting among students of three universities in China.

**Methods:** The cross-section study was designed to document data on anxiety and behaviors including smartphones through a questionnaire. The questionnaire was built by the wx.cn Wechat applet and composed of such three parts as the Zung Self-Rating Anxiety Scale (SAS) used to assess the anxiety state, behaviors including smartphone usage, and demography data. The linkage of self-reported anxiety and smartphone usage was analyzed using the linear model.

**Results:** Overall 246 college students self-reported eligible data for the questionnaire from March 24 to 29 2020. The medium isolation duration of all participants was 20 [8.5, 40] days. Of all participants, 16.7% were evaluated to be anxious with a SAS score, not more than 60. It was not significant in the SAS score between the female and male, medical, and non-medical students. Larger than 70% of participants employed smartphone to occupy their self-isolated time. Smartphone usage was not significantly correlated with the SAS grade ( $r=0.033$ ,  $P>0.05$ ).

**Conclusions:** In this study, college students suffered from slight anxiety during the social isolation against Covid-19 in China. It was suggested that smartphone usage might ameliorate the risk of anxiety during social isolation.

**Keywords:** Anxiety; Zung Self-Rating Anxiety Scale; Smartphone; Social isolation; Questionnaire

## Abbreviations

Covid-19: Coronavirus Disease 2019; PR: People's Republic; SAS: Self-Rating Anxiety Scale; WHO: World Health Organization

## Introduction

Coronavirus disease 2019 (Covid-19) has produced 83,326,479 confirmed cases including 1,831,703 deaths, globally, according to the last updated data from the World Health Organization (WHO) on 5 January 2021 [1]. Since the outbreak of Covid-19 in Wuhan at the end of 2019 [2], special drugs are still absent to control the Covid-19 pandemic. Despite the advent of several vaccines against Covid-19 [3,4], a novel Covid-19 variant has emerged in England and appeared to spread more rapidly than the former ones [5]. It is doubtful that vaccines will exert a powerful influence on the new variant of the Covid-19 virus. Social isolation was the dominant measure used to prevent healthy populations from infection during the Covid-19 epidemic in China [6]. Isolation was demonstrated to be an effective measure to refrain from the transmission of the 1918-21 influenza [7]. Isolation was so extremely executed on January 23, 2020, in China that populations without the Covid-19 infection were required to stay at home. Self-isolation has been being maintained for about

two months in the whole country until the survey was carried out.

It has been reported that isolation in older humans is associated with the incidence of anxiety and depression [8]. A longitudinal investigation revealed that the rate of mental disorders including anxiety soared in college students during the primitive stage of the Covid-19 pandemic [9]. It has been well established that the college stage is a key period of mental health. A large, epidemiological study disclosed that mental diseases in college students have been diagnosed from 22% to 36% over the past decade [10]. Irritability, a diagnostic symptom of major depression, was found to be more prevalent than non-irritability in populations by mean onset-age 26 [11]. Exposure to Covid-19 lead to health care workers in hospitals to suffer a higher risk of anxiety, depression, and insomnia [12]. In contrast, College student is a kind of population vulnerable to be irritated under the deprivation of social contact. During the Covid-19 epidemic, the rapid spread of the virus and the sharply rising death might have exerted tough stress on college students, resulting in their anxiety. Notably, smartphone usage was built up among college students with decreased physical activity [9]. However, little is known about whether smartphone usage might alleviate the rate of anxiety in college students self-isolated during Covid-19.

The reduction in face-to-face social interaction results from self-isolation at home during the Covid-19 epidemic. Due to smartphones are increasingly ubiquitous in china, the vast majority of college students are accessible to smartphones. Self-isolation at home is likely to cause a rise in the usage of smartphones. Several previous studies have reported that the use of social media including smartphones is positively associated with anxiety in college students [13]. Inconsistent with this finding, several studies have demonstrated that the rise in the use of personal computing technologies improves the anxiety of university students [14,15]. The accelerating global pandemic of Covid-19 is still compelling to investigate the association between the use of smartphones and anxiety among college students during self-isolation at home for the Covid-19 epidemic.

The advent of tremendous smartphone apps provided the advantage of online investigation on college students during self-isolation at home. The wxj.cn applet based on Wechat app was used to design and complete the questionnaire, which was carried out to collect the data of anxiety, smartphone use, and other behaviors at home. This cross-section study provided observational evidence on the anxiety state and the characteristics of behaviors, and smartphone use in college students.

## Methods

### Ethical approval

This study was approved by the Medicine Ethics Committee of Fujian Maternity and Child Health Hospital, Affiliated of Fujian Medical University (Approval number: 2020KY067) and was conducted following the Declaration of Helsinki. All participants signed informed consent to participate in the study.

### Participants

We enrolled college students who lived in the mainland of China except for Wuhan during the Covid-19 epidemic. Enrolled college students studied at Fujian Medical University, Fuzhou University, and Southern Medical University. One class of each candidate university was entirely sampled to be surveyed. Eligible participants were at least age 18 but not more than 30 years old and were isolated at home on January 24, 2020, in China. Participants who had Covid-19 disease confirmed by polymerase-chain-reaction assay were excluded. Exclusion criteria included those who were diagnosed as patients with mental illness or were taking antipsychotic drugs or denied to take part in the investigation. Those who agreed to participate via signing a consent form online.

### Study design and data collection

The study was designed as a cross-sectional investigation based on the questionnaire conducted from March 24 to 29 2020. Students were randomly and entirely sampled as participants from three respective classes of such colleges as Fuzhou University, Jinan University, and Fujian Medical University. The questionnaire was divided into three parts including the Zung Self-Rating Anxiety Scale (SAS) [16], behaviors at home using a smartphone, and demography detail. The questionnaire was conducted by the wxj.cn applet based on Wechat app and was self-evaluated using Wechat by scanning the Quick Response Code. Each participant completed the questionnaire only once depending on the parameters set of the wxj.cn applet. The data of each questionnaire was automatically collected by the wxj.cn

applet.

### Zung Self-Rating Anxiety Scale

The self-administered test has 20 items, each of which is scored on a scale of 1-4 (none or a little of the time, some of the time, a good part of the time, most of the time). The SAS questionnaire included 20 items below:

- I feel more nervous and anxious than usual.
- I feel afraid for no reason at all.
- I get upset easily or feel panicky.
- I feel like I'm falling apart and going to pieces.
- I feel that everything is all right and nothing bad will happen.
- My arms and legs shake and tremble.
- I am bothered by headache neck and back pain.
- I feel weak and get tired easily.
- I feel calm and can sit still easily.
- I can feel my heart beating fast.
- I am bothered by dizzy spells.
- I have fainting spells or feel like it.
- I can breathe in and out easily.
- I get feelings of numbness and tingling in my fingers & toes.
- I am bothered by stomach aches or indigestion.
- I have to empty my bladder often.
- My hands are usually dry and warm.
- My face gets hot and blushes.
- I fall asleep easily and get a good night's rest.
- I have nightmares.

There are fifteen questions to assess increasing anxiety levels and five questions worded toward decreasing anxiety levels. The SAS questionnaire was used to access the feelings of the respondents in the past duration of isolation at home. The total SAS score was calculated by the sum of 20 items. Raw total scores range from 20 to 80. Taking the total of score multiplied by 1.25 was transformed to be the index score. A raw score of 36 or an index score of 45 was used as a cut-off point [16]. An index score of 20-44 means normal range, 45-59 shows mild to moderate anxiety levels, 60-74 means marked to severe anxiety levels, greater than 75 does extreme anxiety levels. The internal consistency of the SAS questionnaire was demonstrated to be adequate ( $\alpha = 0.81$ ) among undergraduate students [17].

### Statistical analysis

Descriptive statistics were conducted to analyze the total sample data. Quantitative data were presented as the mean  $\pm$  standard deviation (SD) or median (25<sup>th</sup>-75<sup>th</sup> percentile). Categorical data were shown as frequency and percentages. Continuous variables were analyzed by independent 2-sample T-Test or Mann-Whitney-U-test. Categorical variables were analyzed using the chi-square test

**Table 1:** Participants' characteristics and behaviors during the quarantine.

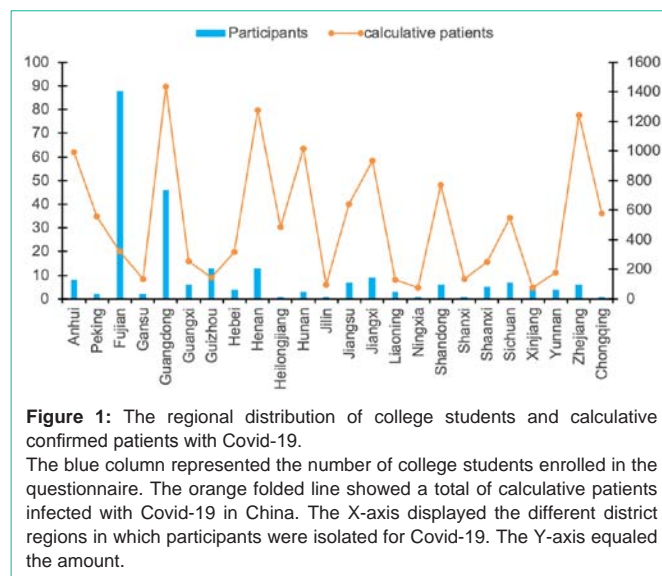
| Variable   | Number   | Percentage (%) |
|--|----------|----------------|
| <b>Gender</b>  |          |                |
| Male   | 109      | 44.3           |
| Female   | 137      | 55.7           |
| Age (Mean ± SD) (year)                                     | 20.7±2.6 |                |
| <b>Faculty</b>   |          |                |
| Medicine   | 176      | 71.5           |
| None-medicine  | 70       | 28.5           |
| <b>Participants from locations with confirmed patients</b> |          |                |
| ≤500   | 133      | 54             |
| 500<N<1000   | 40       | 16.3           |
| 1000≤  | 73       | 29.7           |
| <b>SAS grade</b>   |          |                |
| <50  | 204      | 82.9           |
| 50-59  | 39       | 15.9           |
| 60-69  | 2        | 0.8            |
| 70<  | 1        | 0.4            |
| <b>Major Entertainment</b>                                 |          |                |
| Surfing the Web on smartphone                              | 114      | 46.34          |
| Playing games using smartphone                             | 59       | 23.98          |
| Chatting with family members                               | 18       | 7.32           |
| Reading books  | 14       | 5.69           |
| Live alone   | 17       | 6.91           |
| Other  | 24       | 9.76           |
| <b>Curriculum online per week</b>                          |          |                |
| 5<   | 113      | 45.9           |
| 5 to 10  | 117      | 47.6           |
| >10  | 16       | 6.5            |

SAS: Self-Rating Anxiety Scale.

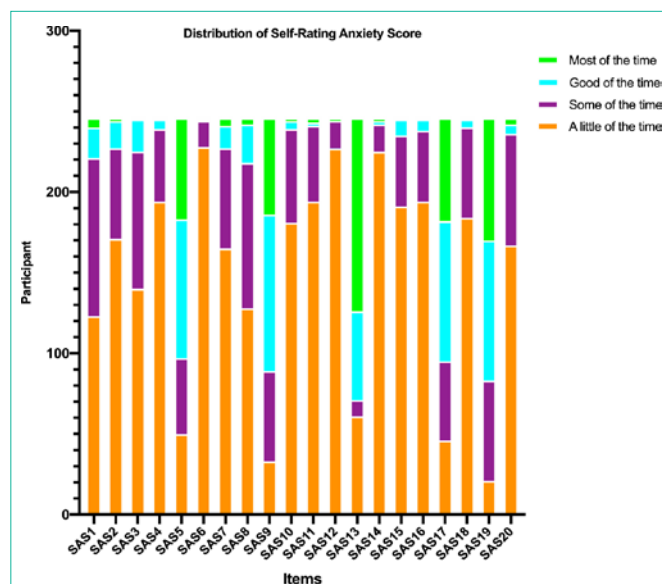
or Fisher's exact test. Pearson and Spearman's correlations were conducted to analyze the relationship between the anxiety grade and the variables smartphone usage. Linear regression analyses were used to examine the relationship between SAS scores and smartphone usage. P-value < 0.05 was identified to be statistically significant. The data were analyzed using IBM SPSS 26.0.

## Results

The sample was composed of 246 undergraduate students (44.3% male and 55.7% female) with a mean age of 20.7±2.6 years. Of all participants, 71.5% (n=176) were medical students, and the others were from none-medical ones. It was reported that 54% (n=133) resided in the locations with not more than 500 confirmed patients and about one-third of students (n=73) lived in the locations with more than 1000 Covid-19 patients (Table 1). Overall participants derived from 25 provinces and equal districts in China covering the majority of infectious regions. After omitting one student from Hubei province with more than 67,000 confirmed patients with Covid-19 till the questionnaire survey, 245 students distributed in the different isolated locations with not more than 1500 confirmed



**Figure 1:** The regional distribution of college students and calculative confirmed patients with Covid-19. The blue column represented the number of college students enrolled in the questionnaire. The orange folded line showed a total of calculative patients infected with Covid-19 in China. The X-axis displayed the different district regions in which participants were isolated for Covid-19. The Y-axis equaled the amount.

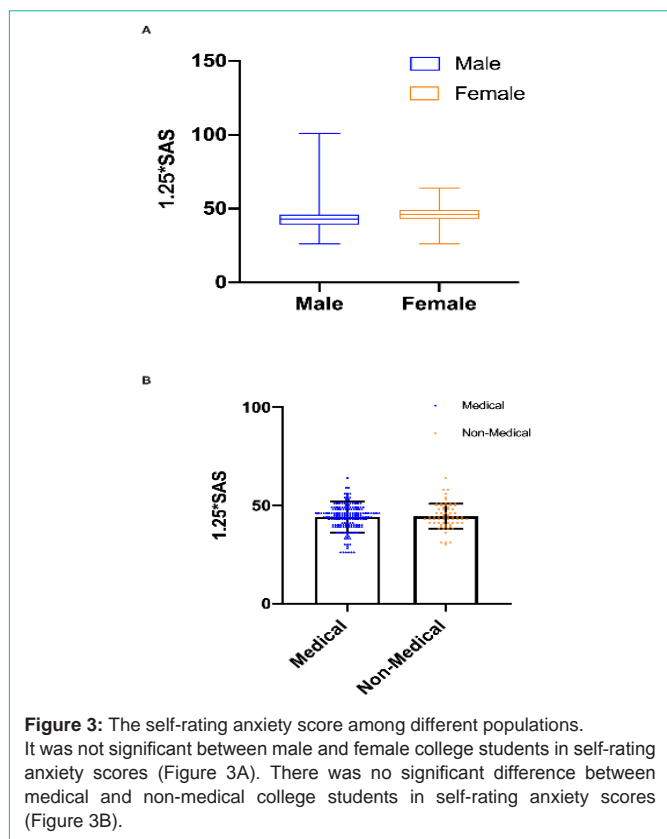


**Figure 2:** The proportional calculator graph of self-rating anxiety score. The X-axis represented 20 items of self-rating anxiety score. The Y-axis showed the number of participants self-reporting the items.

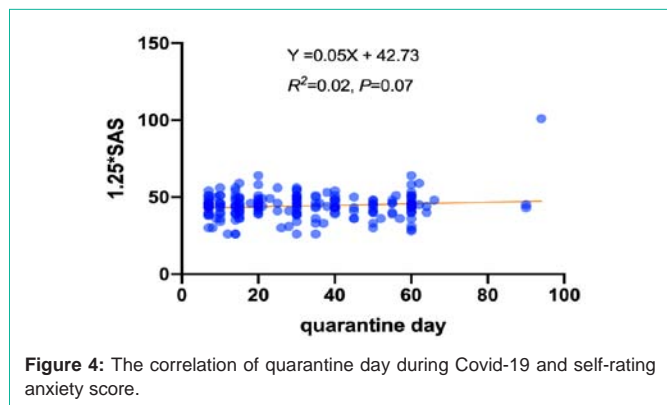
patients reported by the National Health Commission of the People's Republic of China [18] (Figure 1).

Of students in our sample, the average SAS score was 44.20±7.54, and 16.7% (n=41) were identified to be anxious with the SAS score not more than 60. Only one student was evaluated with an anxiety score of more than 70. As shown in Figure 2, more than 100 participants were at the state described by item 5, 9, 13, 17, and 19. The resident 15 items associated with characteristics of anxiety were distributed at a level of a little time or some of the lime (Figure 2). The median SAS scores of male and female students were 42.26 and 45.71 respectively (Figure 3A). There was no extreme difference in the SAS scores between medical and non-medical students (Figure 3B).

The medium isolation duration of all participants was 20 [8.5, 40] days. The quarantine duration was less than 7 days self-reported



**Figure 3:** The self-rating anxiety score among different populations. It was not significant between male and female college students in self-rating anxiety scores (Figure 3A). There was no significant difference between medical and non-medical college students in self-rating anxiety scores (Figure 3B).



**Figure 4:** The correlation of quarantine day during Covid-19 and self-rating anxiety score.

by 37 participants, thus, the data were excluded for following linear regression. Among the excluded data, only 8 items of total SAS were just greater than 45. No significant difference occurred in the relationship between quarantine duration and SAS score (Figure 4). Of the total participants, 70.3% (n=173) used a smartphone to achieve major entertainment including surfing the web and playing games. Smartphone usage was not significantly correlated with the SAS grade ( $r=0.033, P>0.05$ ). Similarly, the correlation between the SAS grade with other variables was shown to be not significant in Table 2.

**Discussion**

In this questionnaire survey based on Wechat software, we found that only approximately 20% percent of college student participants shown to be a little anxious during social isolation for Covid-19 epidemic in China. Our findings in this study suggested

**Table 2:** The correlations between the scores of SAS and variables.

|   | SAS grade |
|---|-----------|
|   | $r^2$     |
| Gender  | 0.116     |
| Age   | 0.065     |
| Participants from provinces with confirmed patients | -0.124    |
| Specialty   | 0.08      |
| Curriculums on line per week                        | 0.035     |
| Smartphone usage                                    | 0.033     |
| Quarantine duration                                 | 0.013     |

that smartphone usage may attenuate the process of anxiety during social isolation.

Covid-19 is found to be an entirely novel infectious disease. Social isolation has been being demonstrated to be a feasible and effective avenue to block the widespread of Covid-19. Clinical trials combined with nonhuman studies have illustrated that social isolation has a strong linkage with anxiety and depressive behavior among adolescents [19-21]. In contrast to these positive data, we found that college students experiencing social isolation during the Covid-19 outbreak are tightly likely to undergo a high rate of anxiety. In our online survey, about 70% of overall participants employed smartphones to surf the Web or play games. A cross-sectional study has revealed that smartphone use disorder is correlated with depression in college students [22]. Besides, a meta-analysis has also shown that people with problematic smartphone use experience significantly increased risks of poor sleep quality, anxiety, and depression [23]. Our survey has found that smartphone use is gently associated with SAS scores. There is a dramatic conflict of whether smartphone use might strengthen anxiety or not.

A plausible explanation has been proposed for the contradictory result that smartphone usage depending on APPs provides an online approach to keep communication with other people despite homestay. Currently, a positive relationship has been disclosed between smartphone APP use and physical activity in psychiatric outpatients during Covid-19 forced isolation [24]. In parallel to our opinion, the authors have stated that smartphone use is accessible to social support during Covid-19 lockdown against the negative effect of in-person social deprivation [24]. Indeed, smartphone use may have a two-side sword impact on anxiety. A strictly controlled study with high quality would be performed to identify the positive correlation between smartphone use and social isolation on mental disorder.

Although confirmed patients from locations participants dwelling are far less than that in other countries rather than China, no other people from China outside have been being confronted with deadly anxiety, threatened by a novel infectious disease. This postulation was supported by our survey that there was no significant difference among college students ranging from male to female, medical students to non-medical ones. A recent report has been published that smartphone addiction is not significantly associated with sleep deprivation but with a skyrocketing risk of anxiety [25]. Inpatients who suffered from social isolation compelled by Covid-19 underwent a higher risk of sleep loss along with a mushrooming



rate of anxiety [20]. Beyond doubt, the relationship between social isolation, smartphone use, and anxiety would be investigated in future studies.

There are several limitations to the current study. First, it fails to exclude the interference deriving from sleep quality and duration during social isolation. A second limitation is the personality without assessment may act as a bias factor. Finally, it is difficult to expand the current finding to general people. Hence, a well-designed randomly controlled trial would be performed in the near future, illustrating whether smartphone usage benefits to relieve the anxiety during social isolation or not.

## Conclusion

College students suffer from a tight risk of anxiety during social isolation for struggling with Covid-19. Smartphone usage by students on campus may exert a dual effect on anxiety, accelerating, or alleviating.

## Declaration

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**Availability of data and materials:** The data-sets used and analysed during the current study available from the corresponding author on reasonable request.

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