ASSOCIATION BETWEEN SMARTPHONE ADDICTION AND MENTAL HEALTH DURING THE COVID-19 PANDEMIC 2021 AMONG INNER MONGOLIA MEDICAL UNIVERSITY STUDENTS, THE PEOPLE'S REPUBLIC OF CHINA

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ความสัมพันธ์ระหว่างการติดสมาร์ทโฟนกับสุขภาพจิตในช่วงการระบาดของโรคโควิด-19 ปี พ.ศ. 2564 ในนักศึกษามหาวิทยาลัยแพทย์อินเนอร์มองโกลเลีย สาธารณรัฐประชาชนจีน

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วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาสาธารณสุขศาสตรมหาบัณฑิต

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Thesis Title	ASSOCIATION BETWEEN SMARTPHONE ADDICTION AND MENTAL HEALTH DURING THE COVID-19 PANDEMIC 2021 AMONG INNER MONGOLIA MEDICAL UNIVERSITY STUDENTS, THE PEOPLE'S REPUBLIC OF CHINA
By	Mr. Longlong Zhao
Field of Study	Public Health
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หลงหลง จ้าว : ความสัมพันธ์ระหว่างการติดสมาร์ทโฟนกับสุขภาพจิตในช่วงการระบาดของโรคโควิด-19 ปี พ.ศ. 2564 ในนักศึกษามหาวิทยาลัยแพทย์อินเนอร์มองโกลเลีย สาธารณรัฐประชาชนจีน. (ASSOCIATION BETWEEN SMARTPHONE ADDICTION AND MENTAL HEALTH DURING THE COVID-19 PANDEMIC 2021 AMONG INNER MONGOLIA MEDICAL UNIVERSITY STUDENTS, THE PEOPLE'S REPUBLIC OF CHINA) อ.ที่ปรึกษาหลัก : นุชนาฏ หวนนากลาง

สมาร์ทโฟนเป็นเครื่องมือหลักในชีวิตประจำวัน ปัญหาที่ตามมาคือการติดสมาร์ทโฟนที่ส่งผลต่อสุขภาพจิต วัตถุประสงค์ของการศึกษาเพื่อหาความสัมพันธ์ระหว่างการติดสมาร์ทโฟนกับสุขภาพจิตของนักศึกษามหาวิทยาลัยแพทย์อินเนอร์มองโกเลีย ในการวิจัยใช้วิธีการสุ่มกลุ่มตัวอย่างนักศึกษาในมหาวิทยาลัยแพทย์อินเนอร์มองโกเลีย จำนวน 500 คน โดยใช้แบบสอบถามเกี่ยวกับข้อมูลทั่วไป พฤติกรรมการใช้สมาร์ทโฟน แบบวัดการติดสมาร์ทโฟนฉบับย่อ ประสบการณ์ชีวิตในช่วงการระบาดของโรคโควิด 19 และแบบวัดภาวะสุขภาพจิต (DASS-21) ในการวิเคราะห์ข้อมูลใช้การวิเคราะห์การถดถอยทวิ และการวิเคราะห์การถดถอยพหุเพื่อควบคุมตัวแปรแทรกซ้อนในการหาความสัมพันธ์ระหว่างการติดสมาร์ทโฟนและซึมเศร้า ความวิตกกังวล และความเครียด ผลการศึกษาพบว่าความชุกของการติดสมาร์ทโฟนร้อยละ 55.4 ความชุกของซึมเศร้า วิตกกังวล และความเครียด ร้อยละ 21.0 30.6 และ 13.8 ตามลำดับ ผู้ที่ติดสมาร์ทโฟนมีโอกาสเสี่ยงที่จะซึมเศร้าเป็น 4.53 เท่าที่ของผู้ที่ไม่ติดสมาร์ทโฟนเมื่อควบคุมตัวแปรเพศ รายได้ต่อเดือน การอาศัยอยู่ในเขตเมือง และการสูบบุหรี่ (OR=4.53, 95%CI=2.63 – 7.81) ผู้ที่ติดสมาร์ทโฟนมีโอกาสเสี่ยงที่จะวิตกกังวลเป็น 6.47 เท่า ของผู้ที่ไม่ติดสมาร์ทโฟนเมื่อควบคุมตัวแปรเพศ เกรดเฉลี่ย ดัชนีมวลกาย รายได้ต่อเดือน และการสูบบุหรี่ (OR=6.47, 95%CI=3.97 – 10.55) ผู้ที่ติดสมาร์ทโฟนมีโอกาสเสี่ยงที่จะเครียดเป็น 4.05 เท่าของผู้ที่ไม่ติดสมาร์ทโฟนเมื่อควบคุมตัวแปรเพศ ชั้นปีการศึกษา และรายได้ต่อเดือน (OR=4.05, 95%CI=2.12 – 7.71) สรุปการติดสมาร์ทโฟนพบได้ทั่วไปในนักศึกษาระดับปริญญาตรีในมหาวิทยาลัยแพทย์อินเนอร์มองโกเลีย จากการศึกษานี้พบว่าการติดสมาร์ทโฟนมีความสัมพันธ์กับซึมเศร้า ความวิตกกังวล และความเครียด จากผลการศึกษาชี้ให้เห็นว่าควรหาแนวทางในการลดการติดสมาร์ทโฟนของนักศึกษามหาวิทยาลัยแพทย์อินเนอร์มองโกเลียเพื่อส่งเสริมสุขภาพจิตให้ดีขึ้น

สาขาวิชา สาธารณสุขศาสตร์ ลายมือชื่อนิสิต .....
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6374028853 : MAJOR PUBLIC HEALTH
KEYWORD: Smartphone Smartphone addiction Mental health Depression Anxiety Stress.

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Smartphone is currently playing a crucial role; consequently, many smartphone users have become addicted and eventually resulted in psychological problems. This study intends to assess an association between smartphone addition and mental health among students of Inner Mongolia Medical University. The researcher employed random sampling technique in data collection by having 500 students of Inner Mongolia Medical University. The questionnaires distributed cover such topics as demographic characteristics; smartphone use behaviors; smartphone addiction scale (SAS-SV) questionnaire; life experience during COVID-19 questionnaire and depression anxiety and stress Scale (DASS-21) questionnaire. As for data analysis, binary logistic regression and multivariable logistic regression for controlling confounding factors were utilized to obtain an association between smartphone addiction and depression, stress and anxiety. The findings indicated that prevalence of smartphone addiction (55.4%); prevalence of depression, stress and anxiety (21.0%; 13.8% and 30.6, respectively). It was also found that the smartphone addicted users tend to experience a 4.53 times higher depression than those non-addicted after adjusting for gender, monthly allowance, residence, and smoking (OR=4.53, 95%CI=2.63 – 7.81); the smartphone addicted users tend to experience a 6.47 times higher anxiety than those non-addicted after adjusting for gender, GPA, BMI, monthly allowance, and smoking (OR=6.47, 95%CI=3.97 – 10.55); the smartphone addicted users tend to experience a 4.05 times higher stress than those non-addicted after adjusting for gender, study year, and monthly allowance (OR=4.05, 95%CI=2.12 – 7.71). In conclusion, smartphone addiction can be generally found among undergraduate students of Inner Mongolia Medical University. This study revealed that there was an association between smartphone addiction and depression, stress and anxiety. It is recommended that the parties and individual concerned have to find effective measures to curb the students' smartphone addiction to promote mental health among students of Inner Mongolia Medical University.

Field of Study:	Public Health	Student's Signature .....
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INTRODUCTION

Rationale and Background

The subversive development of science and technology has a significant impact on our lives and seems to control our lives. The innovation and utilization of science and technology in education, medical treatment and other industries make our lives convenient and relaxed, provide convenience for people's lives, improve the quality of life, increase communication, improve relations, and provide protection for people's lives and health. However, it is also a double-edged sword, which has a particular negative impact on our society and personal behavior. The application of relevant science and technology in industries and life also brings related threats and adverse effects, such as the formation of personal beliefs, the reduction of family members' contact, social isolation, inactivity, obesity, wasting time on useless things, the increase of violence, the adverse effects of children watching violent videos, and so on. Therefore, we should soberly treat and use science and technology, and at the same time, we should not indulge in it too much (Younes, Al-Zoubi et al. 2015, Xin, Xing et al. 2018).

The internet has changed the world. Internet users have increased from 413 million in 2000 to 3.4 billion in 2016. By 2017, half of the world's population is online. Not only has the technology become more readily available across populations but also it is easier to use.

Smartphones have replaced computers and many other devices to a certain extent and have become the primary tool of internet technology. In addition to retaining the

essential functions of the original mobile phone, such as making calls and sending short messages, smartphones have diversified functions and become one of the main tools for people to use the internet. Wonderful mobile games, involving all aspects of applications, network search, micro blog, chat software, access to the web page to expand the scope of communication. The multi-function and convenience of smartphones make them popular, and the number of subscriber increases rapidly. With the popularity of smartphones and the continuous development of their functions, people are increasingly inseparable from smartphones, and the addiction to smartphones has brought a series of problems. In recent years, the addiction rate of mobile phones has been increasing, especially among college students.

Although the application of smartphones in the monitoring and adjusting treatment of diabetes and other chronic diseases is helpful, the excessive use of smartphones will lead to a series of effects, which will have side effects on work, study, and life. In physiological aspects, such as neck pain, sleep disorders, playing mobile phones in the process of driving or walking, leading to safety problems. In mental health, the use of smartphones reduces face-to-face social communication ability and learning ability (Haug, Castro et al. 2015).

In recent years, with the popularity and high application of smartphones, mental health problems caused by smartphone addiction have become a problem that we have to pay attention to it. Smartphone research found that 45.8% of smartphone users feel anxious when they are not around, 27.1% think they spend too much time using smart phones, 22.6% fail when they are aware of the need to reduce the use of smartphones, and 21.0% say it is difficult to study and work because of excessive reliance on smart phones It is more obvious in teenagers (Choi, Kim et al. 2015). At the same time, some studies show that smartphone overuse is related to depression and sleep disorders (Lin, Lin et al. 2015).

Mental health problems have become one of the major burdens of global diseases,

causing pain and medical expenses to individuals and families. College students are a special group experiencing a critical period of transition to adulthood. More and more studies have shown that college students are at high risk of certain mental health problems (Mikolajczyk, Maxwell et al. 2008). Many socio-demographic factors have become influential factors for mental health. For example, low education level is an important risk factor for mental health, which is significantly related to the depression of college students. In addition, other factors such as marital status, living conditions, place of birth, parents' working status, etc. are all related to the mental health of college students (Tayefi, Eftekhar et al. 2020). Some studies are also actively exploring the impact of gender, students from rural or urban areas, medical students or non-medical students, and the impact of grade level on mental health.

It is currently believed that the first confirmed case of COVID-19 was discovered in Wuhan in December 2019. Then a few months later, cases appeared in almost all countries around the world, leading to isolation and increased social distancing to control the epidemic. The COVID-19 outbreak has caused significant changes in people's behavior and activities. Many people have been forced to restrict going out or quarantined. As of April 2020, approximately 3 billion people around the world are required to stay at home. More than 130 countries have ordered a certain degree of restrictive actions to prevent the spread of COVID-19. Home isolation and mandatory requirements have also prompted digital entertainment consumption upgrades (King, Delfabbro et al. 2020), which has led to the full release of mobile phone functions. People use mobile phones to surf the Internet, entertain, communicate, and even online. Gambling has led to an increase in mobile phone addiction. People can only communicate with the outside world through mobile phones (Lin and health 2020). In addition to quarantine, the Chinese government has formulated many relevant policies and methods to fight the epidemic, which is inseparable from mobile phones. For example, mobile phones can be used to obtain information about the epidemic on the Internet and report daily health status to work

or school via mobile phones. Apply for a health code through the mobile application. The health code will display different colors according to the epidemic situation in your area and your own physical health as a common standard, etc. Therefore, during the epidemic period, the influential role of smartphones, it has further promoted people's understanding of mobile phones: use and dependence.

At present, while several studies on smartphone use among college students in China exist, some of which highlighted the correlation with mental health, few, if any, studies concentrated on the correlation between smartphone use and mental health of medical college students in underdeveloped western regions such as Inner Mongolia. Therefore, this paper focuses on the relationship between mobile phone addiction and mental health with depression, anxiety, and stress of students in Inner Mongolia Medical University.

1.2 Research Questions:

1.2.1 What is the extent of prevalence of smartphone addiction during the COVID-19 pandemic among China's Inner Mongolia Medical University students?

1.2.2 What is the extent of prevalence of mental health (depression, anxiety, and stress) during the COVID-19 Pandemic among China's Inner Mongolia Medical University students?

1.2.3 What is the relationship between smartphone addiction and mental health (depression, anxiety, and stress) among China's Inner Mongolia Medical University students?

1.3 Research Objective:

1) To explore the extent of prevalence of smartphone addiction during the COVID-19 pandemic among China's Inner Mongolia Medical University students.
2) To explore the extent of prevalence of mental health (depression, anxiety, and stress) during the COVID-19 pandemic among China's Inner Mongolia

Medical University students.

3) To assess the association between smartphone addition and mental health (depression, stress and anxiety) among students of Inner Mongolia Medical University.

1.4 Research Hypothesis:

H_0: There is no association between smartphone addiction and mental health (depression, anxiety, and stress) among China's Inner Mongolia Medical University students.

H_1: There is an association between smartphone addiction and mental health (depression, anxiety, and stress) among China's Inner Mongolia Medical University students.

1.5 Study Design:

A cross-sectional study was conducted for the present study.

1.6 Conceptual Framework

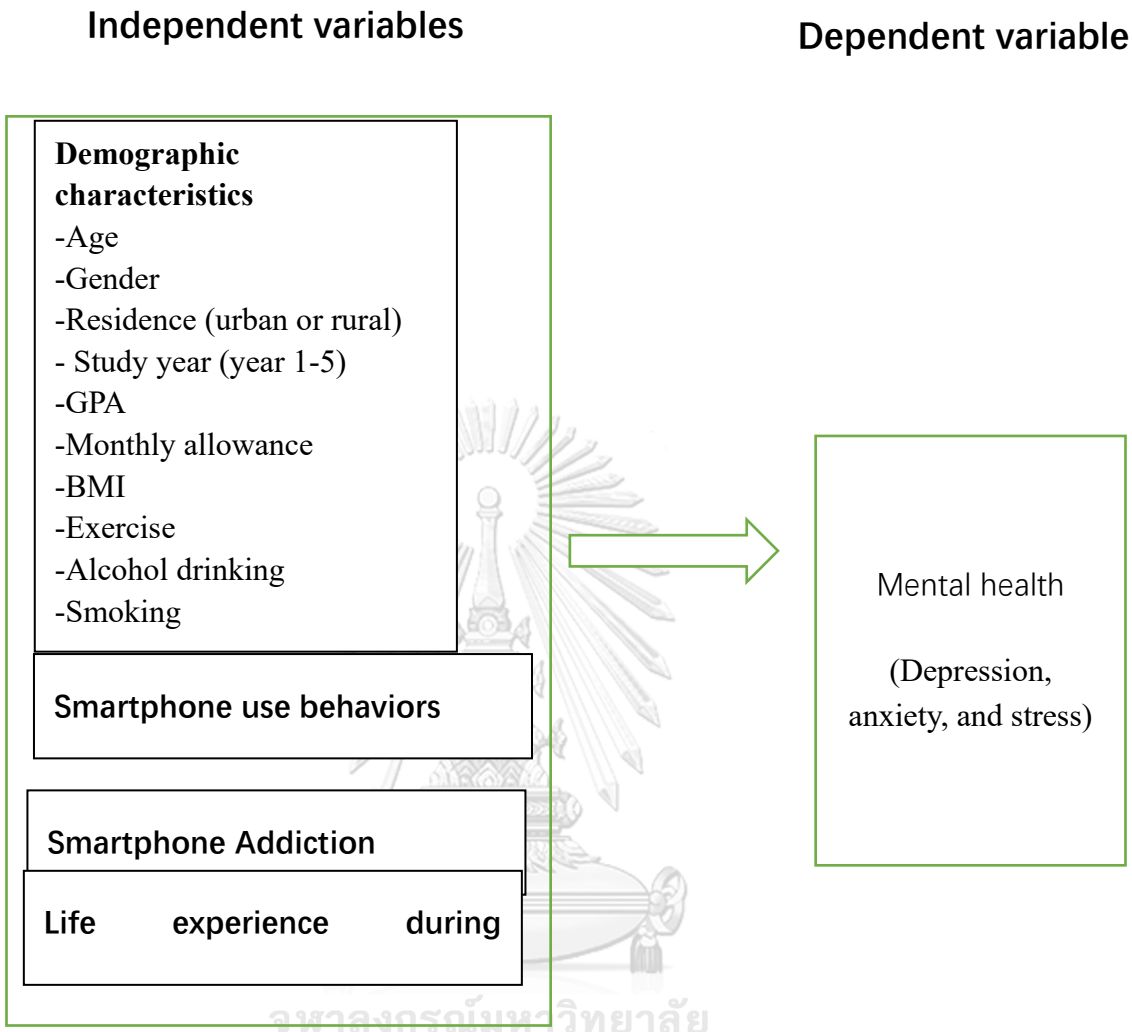

Figure 1: Conceptual Framework

1.7 Operational Definition

Smartphones: A smartphone is "a mobile phone that performs many of the functions of a computer, typically having a touch screen interface, internet access, and an operating system capable of running downloaded applications" (Matar Boumosleh and Jaalouk 2017).

Smartphone addiction: The diagnostic criteria of smartphone addiction were derived from criteria of material abuse according to the Diagnostic and Statistical Manual (DSM IV). The criteria used to diagnose smartphone addiction are consistent with internet addiction, considered as a kind of dependence disorder. In addition, it is not easy to control their use of smartphones, so it has a certain impact on their social function and mental health (Hiscock 2004). The tool was used in order to indicate the level of smartphone addiction was smartphone addiction scale (SAS-SV) questionnaire.

Mental health (depression, anxiety, stress): Mental health can be defined as a state of well-being enabling individuals to realize their abilities, cope with the normal stresses of life, work productively and fruitfully, and contribute to their communities. The tool was used in order to indicate the level of smartphone addiction was depression anxiety and stress Scale (DASS-21) questionnaire.

Inner Mongolia Medical University Students: Inner Mongolia Autonomous Region is in Western China, which is an economically underdeveloped region. There are 11,779 full-time undergraduate students in Inner Mongolia Medical University, distributed in 17 faculties that School of Basic Medicine, School of Mongolian Medicine, School of Health Management, School of Nursing, Inner Mongolia Clinical Medical School, Second Affiliated Hospital, Affiliated People's Hospital, Chifeng Clinical School, School of Pharmacy, School of Public Health, School of Foreign Languages, Third Clinical Hospital, Chinese Medicine College, School of Stomatology, School of Computer Information, School of Humanities Education, First Clinical Medical School with a total of 32 undergraduate majors. Of the 32 full-time undergraduate majors, 8 majors are medical degree students. The school system is five years. There are 24 classes in each grade, totaling 140 classes and 5,759 students. The other 24 majors are non-medical degrees and medical-related majors. The school

system is five or four years, and each grade has 32 classes, a total of 288 classes, and 6,020 students.

1.8 The benefits

Although there have been some previous studies on smartphone addiction and mental health, this research mainly focuses on exploring the relationship between smartphone addiction and mental health among students of Inner Mongolia Medical University. Therefore, the results of this study will help expose the relationship between the mental health status of Inner Mongolia Medical University students and smartphone addiction. On the one hand, the students themselves will increase their awareness of mobile phone addiction, to control over-reliance on mobile phones consciously. However, on the other hand, usage has also strengthened the school's attention to student mobile phone addiction and mental health.

Moreover, the results of this study will also provide material support to the education system and health policy formulation system in Inner Mongolia, which will help formulate targeted policies to promote the mental health of college students in the region.

In addition, this research has made research explorations for medical students and non-medical students on mobile phone addiction and mental health and their correlation. Finally, it provides certain research support for related research.

CHAPTER II

LITERATURE REVIEWS

2.1 Smartphone

2.1.1 Smartphone definition

What is a smartphone? In some articles, the functionality of the phone is explained, "A mobile phone or PHS that incorporates a public general-purpose operating system, to which users can freely add applications, extend functionality, or customize". After the birth of the first smartphone, with the exposure of security, magazines, and advertising media, mobile phone vendors have been vigorously promoting smartphones, and the awareness of smartphones among people has increased rapidly. In October 2008, the awareness of smartphones was only 23%, and by September 2010, it had risen to 93%. At present, almost all consumers know the word "smartphone" (Shiraishi, Ishikawa et al. 2011).

For example, in integrating Internet and mobile phone services, smartphones have made a full integration. In addition to providing traditional mobile phone service functions, combined with Internet functions, young people watch videos on their mobile phones and express themselves on virtual dating platforms, while the elderly focus more on using smartphone video calls. The portability in the traditional sense and the accessibility of any networked area have promoted the widespread use of smartphones (Cha & Seo, 2018).

In addition, smartphones are becoming more and more functional in the world. Various applications for information, communication, education, and entertainment make smartphones more and more indispensable in people's daily lives. Smartphones

with touch screens, access to the mobile Internet through WiFi or cellular network, installation of various functions of smartphone applications, as well as media player, digital cameras and navigation and other functions make it more, and more indispensable (Haug, Castro et al. 2015).

2.1.2 Smartphone use behaviors

Smartphones have gradually become an indispensable part of people's daily lives. People's behaviors of using smartphones are also based on the ability of smartphones to have a touch screen usually, access the mobile Internet through Wi-Fi or cellular networks, and install smartphone applications. As well as other functions such as media players, digital cameras, and GPS-based navigation, and a large number of mobile applications for information, communication, education, and entertainment, it brings great convenience to people's lives (Haug et al., 2015).

As we mentioned earlier, with the rapid development of digital science and technology, the use of smartphones worldwide has spread rapidly. The public health problems caused by the overuse of smartphones have also attracted people's attention. The behavior of using smartphones that is characterized by desire, dependence, tolerance, loss of control, and increased use to obtain satisfaction is defined as problematic intelligent use (PMPU), which leads to physical, mental, and social disruptions. This behavior is rapidly spreading around the world (Tao et al., 2020). For example, As early as 2008, Leung, 2008 found there were 27.4% of Hong Kong teenagers are addicted to smartphones. After more than ten years, this proportion has grown tremendously. Haug et al., 2015 indicated In Switzerland, 98% of teenagers between the ages of 12 and 19 have mobile phones, and 97% of them are smartphones, and behavioral problems related to smartphones are becoming more and more serious. Tavakolizadeh et al., 2014 also indicated there were 36.7% of Gonabad Medical University students have mobile phone overuse. (Shin, 2014) indicated there were

8.88% of Korean college students have a smartphone addiction.

Like many other countries, in recent years, the use of smartphones has become more and more popular in Chinese adolescents. Smartphone has numerous benefits for social and medical purposes. According to a Research Report on Internet behavior of Chinese adolescents in 2014, by December 2014, the size of China's youth Internet users had reached 277 million, accounting for 79.6% of China's youth population. 87.6% of Internet users are teenagers under the age of 18 and who use smartphones to access the Internet (CNNIC). The overall prevalence of Internet Addiction was 26.50% among adolescents in China (Xin, Xing et al. 2018), which is much higher than other Asian countries (range: 6.2–21.2%) (Mak, Lai et al. 2014, Tran, Hinh et al. 2017). Smartphones have replaced computers and many other devices to a certain extent and become the main tool of internet technology. More than a quarter of smartphone users prefer to access the Internet through their mobile phones (Tossell, Kortum et al. 2012).

2.1.3 Smartphone addiction

2.1.3.1 Smartphone addiction definition

Nomophobia, as a new word, was first proposed by British scholars in 2008, and it mainly refers to a fear when mobile phones are not connected (Yildirim & Correia, 2015). Mobile phone addiction is a behavioral addiction that overuses modern technology, lace Internet addiction, and game addiction. The obsessive symptoms of mobile phone users' psychological and social function damage due to excessive abuse of mobile phones due to certain motivations, even severe. There are physical symptoms such as palpitations, dizziness, sweating, and gastrointestinal dysfunction (Redmayne et al., 2011). Although there is no clear and unified concept

of mobile phone addiction, the current consensus view is that mobile phone addiction belongs to the category of behavioral and technological addiction and is a new type of compulsive dependence behavior.

Kwon, Lee, et al., 2013 indicated smartphone addiction is similar to Internet addiction and leads to a series of physical and psychological problems. Based on the overuse of smartphones, Lin et al. proposed that smartphone addiction contains four typical characteristics: withdrawal symptoms, tolerance, overuse, and functional impairment (Lin et al., 2014).

The disruptive development of science and technology has led to the revision of the traditional definition of addiction because addiction is not only limited to drug or alcohol abuse, but also includes blog reading, online games, and even behavior addiction of excessive use of smartphones. For example, the revised chapter of "substance-related and addictive disorders" in the fifth edition of the Diagnostic and Statistical Manual of mental disorders (DSM-5) includes a related behavior condition "pathological gambling" as a diagnostic additive disorder rather than an "impulse control disorder" in a new category on "behavioral addictions". In addition, "Internet Gaming Disorder" is listed in DSM-5 section III as a problematic behavior pending more research before considering it as a formal addictive Although the diagnostic criteria of mobile phone addiction have not been included in DSM -5, more and more studies have confirmed that overuse of smartphones is similar to the symptoms of drug use disorder specified in DSM-5, including the excessive concentration of attention, tolerance, inability to restrain desire, impairment of daily function, and withdrawal reaction after neglect (Matar Boumosleh and Jaalouk 2017). Some studies have also shown that smartphone addiction is closely related to the time and frequency of using mobile phones (Lin, Lin et al. 2015). According to (Lin, Chang et al. 2014), smartphone addiction can be regarded as a subtype of technical addiction. Specifically, Griffiths operationally defined these addictions as non-chemical

behavioral addictions that involve human-machine interaction (Griffiths 1996).

2.1.3.2 Related definition

Addiction: The traditional definition of addiction is limited to substance addiction, that is, the uncontrollable excessive use of chemical substances that affect the mental state, such as alcohol and various drugs(Rachlin, 1990; Walker, 1989). In 2011, the American Association of Addiction Medicine defined it as a chronic disease that mainly affects the brain's reward mechanism, motivation, memory, and related bribery (Medicine). Now addiction is also defined as an individual's repeated desire to engage in a specific activity or abuse a certain substance, knowing that it will bring undesirable consequences but still unable to control it (Mei, 2008).

Behavioral addiction: Behavioral addiction refers to the problem of non-chemical substance addiction proposed by Griffiths in 1996, such as pathological gambling, overeating, Internet addiction, shopping addiction, exercise addiction, sex addiction, etc., all belong to behavioral addiction(Griffiths, 1996). Behavior addiction and substance addiction have many similarities, including psychological, social and, cultural aspects.

Technology addiction: The excessive use of technology by modern technology users shows a high degree of psychological dependence, which is called technology addiction. It is a typical non-material addiction, which is similar to other behavioral addictions to a certain extent (Turel et al., 2011). The six cores include mood changes, salience, withdrawal symptoms, tolerance, conflict and repetition. Technology addiction includes Facebook addiction, video game addiction, internet addiction, mobile phone addiction and so on.

2.1.3.3 Situation of smartphone addiction

The smartphone was widely popularized in 2011, and the number of users began to increase since 2011. The prevalence of smartphones is widespread in children aged 11 and over. As a result, the incidence rate of mental health problems among adolescents has reached a peak. Some studies have shown this phenomenon to be specific to smart phones (Sohn, Rees et al. 2019).

The average user will tap, swipe, and click their phone 2,617 times a day and the average time spent on smartphones is 2hours 51mins a day or 171 mins per day. The top 20% of smartphone users spend more than 4.5 hours a day on their devices,66% of smartphone users are addicted to their phones. 94% of people aged 18-29 have smartphones, 6% have regular cell phones, and 91% of college graduates use a smartphone. 68.8% of Belarusian college students believe that smartphone addiction does have a negative impact (Szpakow, Stryzhak et al. 2011).

China has the highest number of smartphone users, more than 911 million in 2020 (Zoo). According to a report released from Analyses International, the penetration rate of smartphones in China, among those aged 21 to 30 years old, was 68.4%, which is the largest in the smartphone market (Bian and Leung 2015). In China, the penetration rate of smartphones among college students in Inner Mongolia Autonomous Region has basically reached 100%. As the main group of mobile phone addicts, the mental health of college students should be the focus of our attention. In recent years, along with the many benefits of smart phones in social and medical aspects, the utilization rate of smartphones among Chinese teenagers is getting higher and higher. According to the Research Report on Chinese teenagers' behavior in December 2013, the scale of Chinese teenagers' Internet users reached 277 million in 2014, accounting for 79.6% of the national youth population, of which 87.6% are teenagers under the age of 18 who use smartphones to surf the Internet(CNNIC). The Internet addiction rate of teenagers in China is 26.5%, much higher than that of other

Asian countries(Tran, Hinh et al. 2017). A study conducted among 414 Chinese university students (aged 19–26 years) identified 13.5% of the sample as smartphone addicts (Bian and Leung 2015).

2.1.4 Theory of Smartphone Addiction

The related theories of smartphone addiction include the diagnosis of substance dependence in DMS-IV, Media Dependence Theory, use and satisfaction theory, etc.

（1）The diagnosis of substance dependence in DMS-IV

Substance dependence is the maladaptive application of a certain substance, leading to clinically apparent painful functional deficits, manifested by withdrawal symptoms, tolerance, overuse, inability to get rid of, craving, impaired social function, etc., and manifest at least 3 times within a year Only one symptom can be diagnosed (Kong & Compile, 2003). Many scholars have compiled measurement tools for mobile phone addiction based on the revised standards.

(2) Media Dependence Theory

The Media Dependence Theory (Ball-Rokeach & DeFleur, 1976) was put forward by Ball-Rokeach and DeFleur in 1976, mainly discussing the relationship between mass media and social systems. If the individual must rely on the audience medium to accomplish certain needs and purposes, the audience medium and the individual are essential. The audience's dependence on the media is interactive but not equal. In the context of the convergence of digital streaming media, "mobile phones are more popular than telecoms, more interactive than newspapers, and more portable than TVs", and their advantages take the lead in new media, leading to excessive use of mobile phones and even addiction.

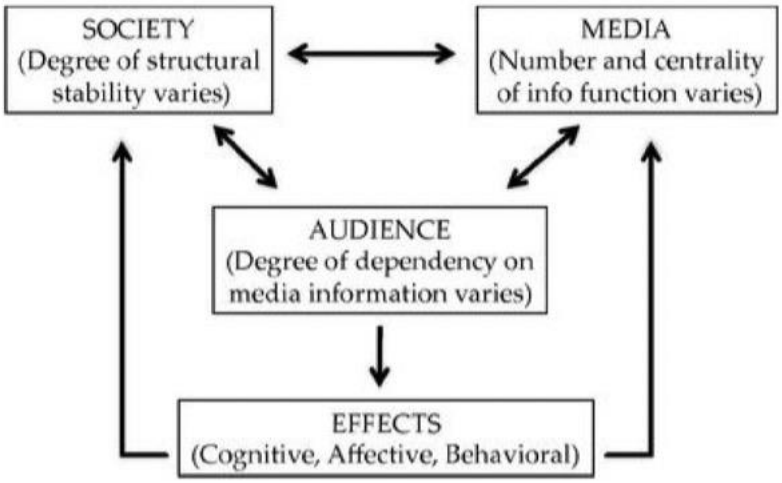

Figure 2: Ball-Rokeach and DeFleur's Media Dependence Theory Model
Source: A dependency model of mass-media effects (Ball-Rokeach & DeFleur, 1976)

(3) User and Gratification Theory

User and Gratification Theory emphasizes that audiences actively use media, all based on personal needs and wishes while restricting the process of media communication. In 1973, Blumler and Katz summarized five significant needs for the personal use of media, including cognition, emotion, personal integration, social integration, and stress relief. Summarized as the process of "social factors + psychological factors media expectations media contact demand satisfaction" (Katz et al., 1973). According to this theory, Park divides the motivation of mobile phone use into habitual use and instrumental use (Park, 2005).

(4) The theory of fluid state

Csikszentmihalyi put forward the theory of the fluid state, also called "intoxication experience", "flow experience", etc. The theory describes that a fluid state is a special state that occurs naturally and is completely incidental and self-enjoying (CSikszentmih & Flow, 2008). In the process of mobile phone use,

mobile phone addicts integrate their behavior and consciousness, have clear goals and clear feedback, and fully autonomously pay attention to the information provided by the mobile phone without trying to control it, and the self-awareness and sense of time disappear. This experience is so enjoyable People will maintain this state at a higher cost, leading to individual mobile phone addiction.

（5）Albert Bandura’s theory of Self-efficacy

American social psychologist Albert Bandura put forward a sense of self-efficacy in a social cognition theory and gave a new explanation of motivation. Self-efficacy is an individual’s supervisory evaluation of the completion of a certain activity. The results of the evaluation may affect their cognition, emotions, that is, their behavioral motives, thereby regulating or controlling individual behavioral changes. Behavioral results affect individual behaviors. In addition, cognitive remodeling has an expectation on behavioral abilities and results that will also affect individual behaviors. The stronger the sense of self-efficacy, the longer the duration of sex (Bandura, 1986; Bandura et al., 1999). Chiu's research found that social self-efficacy and blood self-efficacy may have an intuitive and vital impact on smartphone addicts who have poor interpersonal relationships and academic performance (Chiu, 2014).

（6）Skinner’s reinforcement theory

Skinner, the representative of American neo-behaviorism, proposed the behaviorism reinforcement theory, which emphasizes that people or animals will take certain actions to affect the environment in order to achieve a certain purpose. When the consequences of this behavior are beneficial to the individual, the behavior will be repeated, and vice versa. The behavior weakens or disappears. Jingjing Wang used this theory to analyze the reasons for the dependence on mobile phones (Wang, 2015). The addictive behavior of smartphones can be understood as the feature-rich

performance of smartphones to meet various needs and produce psychological pleasure; for some individuals with social difficulties, they can communicate through mobile phones in order to escape the frustration that may be faced by real interactions to satisfy themselves The emotional catharsis and psychological comfort. The above situation encourages the reoccurrence of individual mobile phone use, gains positive reinforcement, and the cycle causes addiction.

(7) Other relevant theories

Addiction involves a chronic condition of the motivational system in which there is an abnormally and damagingly high priority given to a particular activity. The situation has changed considerably in recent years. Nowadays, the term ‘addiction’ tends to be applied to a syndrome at the center of which is impaired control over behavior to the degree that is causing or could cause significant harm. The fact that there is harm is important because, otherwise, addiction would be of limited interest. It certainly would not merit spending large sums of public money researching, preventing, and treating it. There is impaired control in that an addicted individual feels a compulsion to engage in the activity concerned, or else it takes on a priority in his or her life that seems excessive. In many cases, but not always, the addicted individual expresses an apparently sincere desire not to engage in the activity but fails to sustain abstinence (West and Brown 2013). There is no lack of theoretical research in the field of addiction, including psychological theory, biological theory, sociological theory, economic theory, biological theories and more. A long time ago, The first meeting of what is now the Society for the Study of Addiction was held in 1884 and their scientific ambition required the lay understanding of addiction to be formalized. Early efforts in this direction focused on establishing addiction as a medical disease rather than a moral or spiritual issue. The society defined ‘it as a diseased state of the brain and nerve centers characterized by an irresistible impulse to indulge in intoxicating liquors or other narcotics, for the relief these afford, at any

peril' (Edwards 2006, West and Brown 2013). The situation has changed considerably in recent years. Nowadays, the term 'addiction' tends to be applied to a syndrome at the center of which is impaired control over behavior to the degree that is causing or could cause significant harm.

There are several theories to explain the technology and smartphone addiction. According to behaviorism, it is a kind of learning behavior and the principle of stimulation response reinforcement. So, like any other learning behavior, smartphone addiction can be changed. Behaviorism was first founded by American psychologist John broadus Watson. He famously said: give me more than ten healthy babies, which can be trained in a specific environment to become writers, athletes, doctors, lawyers, and even thieves. Although this is too extreme, it also reflects the shaping and influence of acquired environment and education on human behavior. Behaviorism holds that human behavior is shaped and formed by stimulation, reaction, and habit. It is found that the core element of addictive behavior is the psychological desire for something. It is a kind of psychological experience that strongly requires the use of specific substances that cause addictive behavior, and it is also a subjective dynamic state(Tiffany and Wray 2012). Smartphone as a kind of reinforcement, every time, using a mobile phone is a process of reinforcement. Every time people feel happy and convenient by using mobile phones, they will establish a certain reaction with the brain and form the episodic memory-related to mobile phone behavior, thus forming a trigger behavior reward reinforcement mode. After long-term and multi-frequency use of mobile phones, it will lead to smartphone I can understand the situation of mobile phone addiction.

According to the theory of psychodynamics, smartphone addiction is a reaction to avoid frustration, gain pleasure, and forgetfulness. Psychodynamics, also known as psychoanalysis, was first founded by Sigmund Freud, a sick doctor. According to psychoanalysis, all human behaviors originate from a certain desire or motivation in

the heart, and all behaviors are influenced by it intentionally or unintentionally. People addicted to smartphones are caused by the strength of ID, which follows the principle of happiness and pursues happiness and satisfaction. Following the realistic principle of self, individuals are required to put away their mobile phones to study, work, or exercise. Obviously, these things are not as easy as using mobile phones to play games, which leads to the self cannot control ID well, resulting in psychological conflict. Social and cultural trends believe that smartphone addiction is the result of social culture. The cognitive theory attributes smartphone addiction to distorted ideas and schemata.

In addition, the humanism founded by Abraham h. Maslow and Carl ransom Rogers also provides theoretical support for smartphone addiction. They believe that human nature is good, can self-motivate, make progress, and ultimately achieve self-realization. Abraham H. Maslow's hierarchy of needs theory points out that people's needs are like five pyramids, met from bottom to top. When the needs of which level are not met, there will be psychological and behavioral problems. Some studies have found that people with a higher level of loneliness are more likely to have smartphone addiction (Enez Darcin, Kose et al. 2016), and people with a higher level of self-esteem are more likely to have mobile phone addiction. Social needs are not met, which leads to negative emotions such as anxiety and pain (Yang 2016). The potential motivation of addictive behavior alleviates negative emotions and makes people temporarily escape from pain (Townsend 2000). Through smartphones, people can get a certain sense of what is the psychological satisfaction and relieve negative emotions. In this period, they are more and more dependent on smartphones.

Finally, there is a comprehensive view that smartphone addiction results from comprehensive effects of personal, cultural, social, environmental, psychological, and emotional factors (Davis 2001, DURAN 2003).

2.2 Mental health

2.2.1 Mental health definition

According to the World Health Organization (WHO), mental health is “a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and can make a contribution to his or her community”(Organization).

Many related studies have proved that mental disorders are related to many risk factors. For example, some studies have shown that poverty and social disadvantage have a complex and two-way relationship with mental disorders: people who grow up in low-income families increase the risk of adverse life, such as lack of food, violence, lack of education, and lack of community network of social life Risk factors of mental health (Duarte, Hoven et al. 2003, Patel and Kleinman 2003).

In addition, the central theme is the lack of control that young people in these groups might have in their lives. Cultural factors are a major influence on mental health, as evidenced by the large variations in the prevalence of mental disorders between different cultures (Hunter and Hunter 1999).

Strong evidence is available for the contribution of genetic and biological factors, particularly for depression, psychoses, and severe behavior disorders (Patel, Flisher et al. 2007).

2.2.2 Prevalence of mental health

For a long time, mental health problem has been a major problem in the world. With the rapid development of social economy and the acceleration of the aging process in the world, mental health problems have shown a rapid upward trend, which has become more and more serious in the world. So far, the disease burden caused by

mental health has ranked second in the world (Sepanlou, Safiri et al. 2020). Common mental disorders refer to two main diagnostic categories: depressive disorders and anxiety disorders. These disorders are highly prevalent in the population (hence why they are considered 'common'), and impact the mood or feelings of affected persons; symptoms range in terms of their severity (from mild to severe) and duration (from months to years). These disorders are diagnosable health conditions, and are distinct from feelings of sadness, stress, or fear that anyone can experience from time to time in their lives. According to statistics, in 2015, the proportion of people with depression in the world reached 4.4%, and the proportion of women (5.1%) was higher than that of men (3.6%). The prevalence rate of depression varies with age. The older the adult population, the higher the prevalence rate. The prevalence rate of women aged 55-74 is 7.5%, and that of men is more than 5.5%. Children and adolescents under 15 also have depression, but the prevalence rate is lower than that of older age groups. According to the statistics of 2015, 322 million people suffer from depression in the world, nearly half of them live in Southeast Asia and the Western Pacific region, reflecting that the population of these two regions (such as India and China) is relatively large. According to statistics, 3.6% of the global population suffered from an anxiety disorder in 2015. Like depression, anxiety disorder is more common in women (4.6%) than men (2.6%).

Although the prevalence of anxiety disorder in the elderly is lower, there is no significant difference in the prevalence of anxiety disorder among different age groups. In terms of statistics in 2015, due to population growth and aging, the number of anxiety patients in 2015 increased by 1.49 billion compared with that in 2005, and the number of anxiety patients in the world in 2015 was 264 million(WHO, 2017).

In China, the disease burden caused by mental disorders accounts for 13% of all non-communicable diseases burden (Charlson, Baxter et al. 2016). Hence, mental health has become a major public health problem and social problem. According to

the epidemiological survey in four provinces of China, the prevalence of mental retardation in Chinese adults is 17.5%, and the prevalence of depression, anxiety. and schizophrenia is the highest and substance use disorders were 6.1%, 5.6% and 5.9% (Phillips, Zhang et al. 2009). According to the WHO report, the recognition rate of global mental disorders is around 50%, and the recognition rate in China is far below the world average (Que, Lu et al. 2019).

Similarly, the mental health of college students in Inner Mongolia is not optimistic. There is currently some mental health research on college students in Inner Mongolia in China.

2.3 Smartphone addiction and mental health

Smartphone addiction is found to be related to public health. Some studies have shown that smartphone addiction is associated with depression, anxiety and sleep disorder in adolescents(De-Sola Gutiérrez, Rodríguez de Fonseca et al. 2016). Five types of smartphone addiction symptoms appeared in 414 Chinese college students aged 19-26, preoccupation, inability to control craving, productivity loss, and feeling anxiety and loss (Bian and Leung 2015). Some studies have shown that excessive use of smartphones, type A personality, depression, anxiety, and lack of family social support are risk factors for smartphone addiction. High-stress levels and low emotions may lack active stress response and emotion management techniques, and are extremely easily. Addicted to smartphones (Matar Boumosleh and Jaalouk 2017). In addition, studies have shown that problematic smartphone usage is associated with depression, self-reported anxiety, long-term insomnia, maintenance insomnia, increased perceived stress, and poor educational attainment has some relevance. In general, smartphone addiction is a risk factor affecting mental health, well-being, and daily function(Sohn, Rees et al. 2019).

2.3.1 Smartphone addiction and Depression

Depression is one of the main mental health diseases. Many research on the relationship between smartphone addiction and mental health have pointed out that smartphone addiction has a certain correlation with depression. For example, in one study by Samantha Sohn called “Prevalence of problematic smartphone usage and associated mental health outcomes amongst children and young people”: a systematic review, meta-analysis, and GRADE of the evidence in 2019 aimed to conduct a systematic review and meta-analysis to examine the prevalence of PSU and quantify the association with mental health harms, the result demonstrated that PSU (problematic smartphone usage) was associated with an increased odds of depression (Sohn, Rees et al. 2019). Another study of Aljohara A. Alhassan called “The relationship between addiction to smartphone usage and depression among adults: a cross sectional study”. This study demonstrated that the positive correlation between smartphone addiction and depression is alarming. Therefore, reasonable usage of smartphones is advised, especially among younger adults and less educated users who could be at higher risk of depression (Alhassan, Alqadhib et al. 2018).

2.3.2 Smartphone addiction and Anxiety

Many studies have shown that smartphone addiction has an impact on anxiety and depression in mental health. Many smartphone addicts suffer from depression and anxiety at the same time.

For instance, in a study by Jocelyne Matar Boumosleh called “Depression, anxiety, and smartphone addiction in university students: a cross-sectional study”. In this study, 688 college students were randomly selected to complete a survey, including social demographic characteristics, lifestyle, personality types, and mobile phone use related variables, as well as depression and generalized anxiety tests. Finally, through analysis, it is concluded that smartphone addiction is highly

correlated with anxiety, depression, and sleep disorders. In the other study, the research of Sam-wook Choi called “Comparison of risk and protective factors associated with smartphone addiction and Internet addiction”. The results show that the risk factors of smartphone addiction include female gender, Internet use, drinking, and anxiety. The difference between smartphone addiction and Internet addiction may be due to the high availability of smartphone (Choi, Kim et al. 2015).

2.3.2 Smartphone addiction and Stress

Although most research on smartphone addiction and mental health mainly discusses the relationship between smartphone addiction and depression and anxiety, stress is also an indispensable element in the research of smartphone addiction and mental health. For example, in a research by Maya Samaha called ‘Relationships among smartphone addiction, stress, academic performance, and satisfaction with life’. To promote the research results of the negative impact of smartphone addiction on mental health and well-being, in this study, one is to study the relationship between smartphone addiction and stress, academic performance related life satisfaction, and the other is to explore whether the stress and academic performance related life satisfaction will lead to primary smartphone addiction. Finally, the research shows that the risk of smartphone addiction is positively correlated with perceived stress and negatively correlated with academic achievement (Samaha and Hawi 2016).

2.4 Life experience during COVID-19 pandemic

In the past 20 years, people’s public health and health have faced greater challenges. Various new viruses have emerged one after another, showing high pathogenicity or high transmissions, such as SARS in 2003, H1N1 in 2009, and 2012 MERS-CoV in 2014, and Ebola in 2014. In 2019, a new infectious virus appeared, called COVID-19 (Houlihan & Whitworth, 2019). As of June 2, 2021, 170, 426, 245

confirmed cases of COVID-19 and 3,548,628 confirmed deaths have been reported to the World Health Organization (WHO). China is the first country to identify COVID-19 as the cause of the outbreak. On January 23, 2020, the Chinese government implemented a lockdown policy on 10 cities, including Wuhan, and the whole country did its utmost to contain the spread of COVID-19. The WHO declared the COVID-19 outbreak as an international public health emergency on January 30, 2020 (Mahase, 2020), and declared a pandemic on March 11, 2020(Organization, 2020). Subsequently, Iran, Italy, South Korea, Europe, and the United States discovered a rapid increase in the number of COVID-19 cases in March 2020. With the deterioration of the epidemic situation, the world has entered a state of fighting, and various countries have successively introduced policies to terminate travel and block countries.

Soon after the official announcement of the COVID-19 epidemic, China quickly initiated comprehensive infectious disease control measures. After the blockade of Wuhan (Government, January 23, 2020), as of January 26, 2020, 30 provinces across the country have launched a first-level response mechanism to public health emergencies. In addition to investing a large amount of money (China, February 9, 2020) to fight the epidemic, the Chinese government has extended the Spring Festival holiday in order to reduce the flow of people, postponed the spring semester, cancelled mass gatherings and controlled transportation. In all regions of the country, with communities as a unit, the flow of supervisory personnel is strictly controlled, and residents reduce unnecessary outings. Non-governmental organizations have also assumed the responsibility of isolating residents in each community and helping to solve the difficulties in actual life. Almost all residents have implemented personal protection such as home isolation, social distancing, and wearing masks. In addition, the spread of media such as the Internet has been increased, so that residents can obtain reliable information and medical knowledge through the Internet, reducing the impact of misinformation and rumors (Zhang et al., 2020). The students of Inner

Mongolia Medical University stayed at home from the holiday in January 2020 to May 2020 and took online courses for more than 2 months. Due to restrictions on going out for 5 months, all entertainment activities are prohibited. Therefore, they can only communicate, study and entertain with friends through the Internet at home. Now, although Chinese schools have opened, college students are still restricted from entering and leaving the school casually, and only activities within the school are allowed if it is not necessary. Because of careful home quarantine and the closure of all entertainment and public places, the epidemic in China was brought under control in time (H. Wang et al., 2020), until the last few cases in the region. At the same time, China has been at the forefront of the world's research and development of a COVID-19 vaccine and has accelerated its popularization, and has implemented free vaccination for all people (Yin et al., 2021). Globally, as of 2 June 2021, a total of 1,581,509,628 vaccine doses have been administered. As of 13 May 2021, a total of 388,313,603 vaccine doses have been administered (WHO).

Jane RW Fisher (Fisher et al., 2020) in his article indicated Australian adults experienced extensive changes in their mental health during the first month of travel restrictions due to the COVID-19 outbreak. About a quarter of the respondents reported having symptoms of moderate depression or anxiety, which was much higher than the survey of American adults in 2005-2008 (Shim et al., 2011), or the system review in 2014 (Haller et al., 2014). Samantha K Brooks pointed out that in addition to the inherent pressure caused by the disease itself, large-scale home travel restrictions and isolation are new experiences that have aroused people's concerns about individual and collective reactions. Recent studies of quarantined people and healthcare providers have revealed many emotional results, including stress, depression, irritability, insomnia, fear, confusion, anger, frustration, boredom, and stigma associated with quarantine, some of which are removed from quarantine still exist (Brooks et al., 2020). COVID-19 has had an amazing impact on personal and collective health, as well as emotional and social functions. In addition to providing

health care, already struggling health care providers also play an important role in detecting psychosocial needs and providing psychosocial support to patients, health care providers, and the public-these activities should be included in general pandemic health care (Pfefferbaum & North, 2020). A study by Cuiyan Wang from China shows that long-term lockdown has a more obvious psychological impact on respondents, especially those aged 12-21.4. The psychological impact of this age group is mainly caused by the long-term closure of schools, and they need to be online. Unscheduled characterization of educational support, examination, and admissions arrangements (C. Wang et al., 2020).

CHAPTER III

RESEARCH METHODOLOGY

3.1 Research Design

The research design of the study was a cross-sectional and random sampling technique.

3.2 Study Area

The study area of this study was in Inner Mongolia Medical University Students, China in 2021.

3.3. Study Period

The study was implemented in June 2021. After the proposal was submitted to the ethics committee of Inner Mongolia Medical University in May and approved, data collection was conducted from May to June, and data analysis and research paper were completed in July.

3.4 Study Population and Sample

Population: The population of the study was Inner Mongolia Medical University Students, China

Sample: Inner Mongolia Medical University Students, China

Inclusion Criteria

- Students who used smartphones
- Students both male and female who studied in Inner Mongolia Medical University Students, China (Year 1-5)

- Students who were willing to participate in the study

Exclusion Criteria

Students who cannot read and write in Chinese

3.5 Sampling Technique:

Using a two-stage cluster random sampling, in the first step, Randomly selected 5 colleges (Selected one college every two according to the ranking of all colleges by the school) from the 17 colleges of Inner Mongolia Medical University; The second step was to systematic random sampling 100 students from 5 colleges with quota sampling 100 students with a tail number of 1 were randomly selected from the student numbers of all students. In total, there were 500 samples.

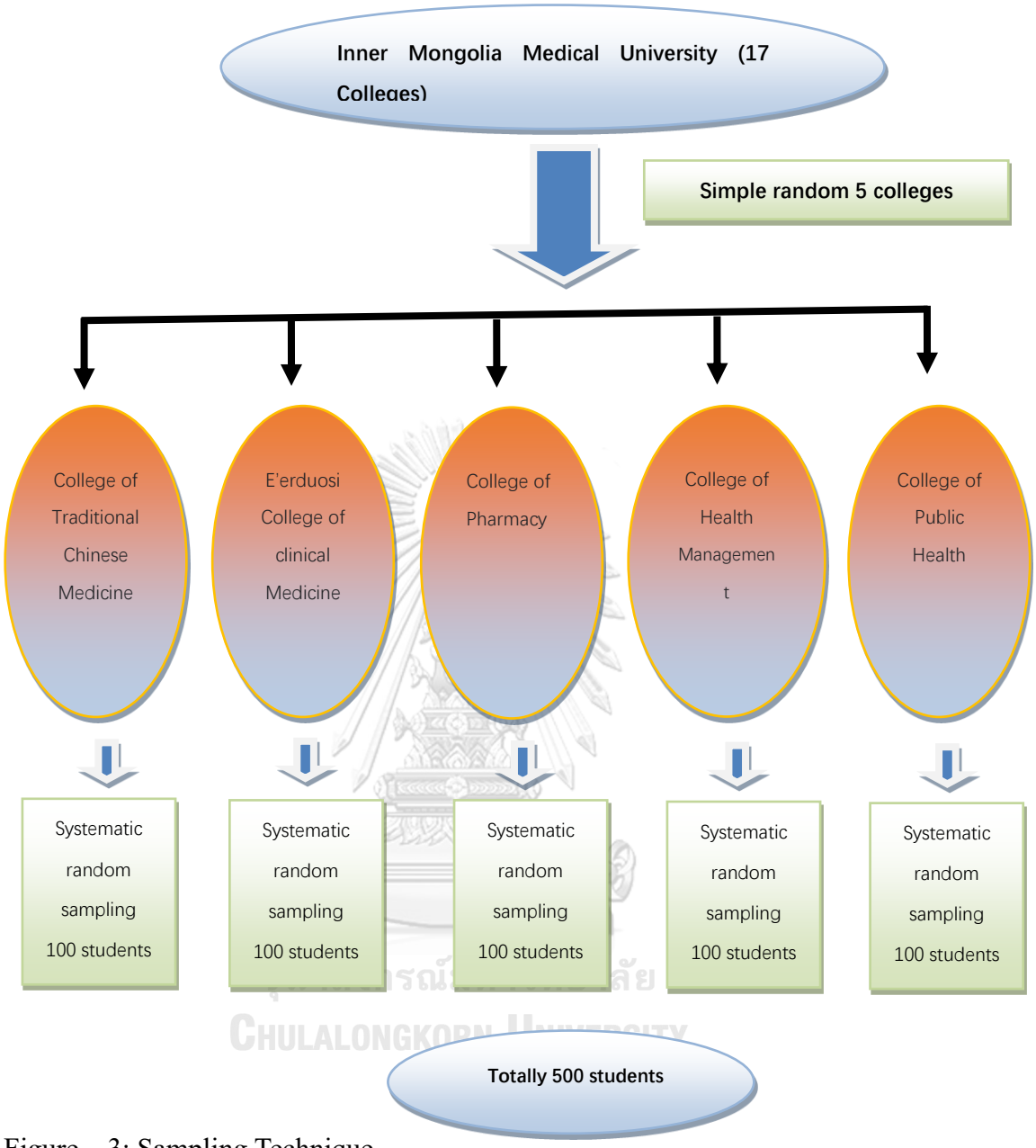

Figure 3: Sampling Technique

3.6 Sample & Sample Size:

The sample size of the study was calculated by using Cochran's sample size formula. The prevalence of Smartphone Addiction was 64.5 from the study of Cell Phone and Internet Addiction among Students was Isfahan University of Medical Sciences, Iran (Maryam Amidi Mazaheri, 2014).

According to Cochran's sample size formula: $n = \frac{Z^2_{\alpha/2}\,(p*q)}{e^2}$ at 95%CI

n = number of participants

z = 1.28 : Critical value for 80% confidence level

e = 0.03 : Absolut precision required

p = 0.64 : Prevalence of smartphone addiction

Therefore:

$$n = \frac{Z^2_{\alpha/2}\,(p*q)}{e^2}$$

$$n = \frac{1.28^2(0.64*0.36)}{0.03^2}$$

$$n = 419.43$$

For above formula, the minimal participants are 420 students. 20% participants (83 students) are added to avoid students who are not complete answering the questionnaire. So, the total rounded sample size is 500 students.

3.7 Measurement Tools

Part 1 Demographic Characteristics

The demographic part of the questionnaire include age, gender, faculty, major, grade, GPA, monthly allowance, BMI, residence (come from urban or rural), physical exercises (how many minutes spend on physical exercises and which kinds of physical exercises), smoking, and drinking alcohol.

Part 2 Smartphone use behaviors

Smartphone use behaviors are assessed by 4 questions concern the following: (1)

How often do you use smartphone a week which they could choose by “Every day”, “5-6 day per week”, “4-5 day per week”, “2-3 day per week”, “Once per week” or “less than once per week”; (2) During weekdays, how long do you use smartphone per day? (3) During weekends, how long do you use your smartphone per day ?(4) What is your main reasons for using a smartphone which could respond by “s To have social communication (talking, chatting)”, “To watch movies”, “To listen to the music”, “To play games”, “To search for educational knowledge”, “To study online class”, “To follow up news coverage” or “others” (Haug et al., 2015).

Part 3 Smartphone Addiction Scale (SAS-SV) Questionnaire

Smartphone addiction was assessed by SAS-SV (Kwon, Lee, et al., 2013) contains 10 items, each score on a Likert scale of 1 (strongly disagree) to 6 (strongly agree). This 10- item self-report instrument was developed and validated in a sample of 343 boys and 197 girls from Korea. The measure’s items were selected from the original Smartphone Addiction Scale (SAS) based on their validity, as established through review by 7 experts. The results of the SAS-SV analysis indicated a Cronbach’s alpha of 0.911. Among boys, the area under the curve (AUC) value was 0.963 (0.888–1.000), the cut-off value was 31, the sensitivity value was 0.867, and the specificity value was 0.893. Among girls, the AUC value was 0.947 (0.887–1.000), the cut-off value was 33, the sensitivity value was 0.875, and the specificity value was 0.886. Based on the cut-off values, this SAS-SV was considered an appropriate tool for assessing smartphone addiction. Based on the results of the ROC analysis conducted by Kwon, Kim et al (Kwon, Kim, et al., 2013). we used cut-off values of 31 and 33 for male and female participants, respectively. A native Chinese fluent in English translated the English SAS-SV into Chinese with local adaptations. We modified the 8th item of the original SAS-SV “Constantly checking my smartphone so as not to miss conversations between other people on Twitter or Facebook" by

replacing "Twitter or Facebook" with "Microblog, or WeChat," which were more relevant to this study population. Backward translation was conducted by a native English speaker fluent in Chinese. Discrepancies were resolved by discussion and further modification before the instrument was finalized for use in this study.

At the same time, I mainly refer to Li Li's doctoral dissertation "Impulsivity, Other Related Factors and Therapy of Smartphone Addiction in College Students" included in the "Chinese Doctoral Dissertations Full-text Database". The Chinese version has been used in her paper to ensure the reliability of the questionnaire.

Part 4 Life experience during COVID-19 questionnaire

This part of the questionnaire has 18 questions (Shalaby et al., 2021). These items are mainly for participants' life experiences during COVID-19. Therefore, participants are required to choose according to their actual situation.

Part 5 Depression Anxiety and Depression Scale (DASS-21) Questionnaire

DASS-21 Scoring Instructions(Antony et al., 1998)

The DASS-21 should not be used to replace a face-to-face clinical interview. If you are experiencing significant emotional difficulties, you should contact your GP for a referral to a qualified professional.

Depression, Anxiety and Stress Scale - 21 Items (DASS-21)

The Depression, Anxiety and Stress Scale - 21 Items (DASS-21) is a set of three self-report scales designed to measure the emotional states of depression, anxiety, and stress.

Each of the three DASS-21 scales contains 7 items, divided into subscales with similar content. The depression scale assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/involvement, anhedonia, and inertia. The anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and

subjective experience of anxious affect. The stress scale is sensitive to levels of chronic non-specific arousal. It assesses difficulty relaxing, nervous arousal, and being easily upset/agitated, irritable/over-reactive, and impatient. Scores for depression, anxiety, and stress are calculated by summing the scores for the relevant items.

The DASS-21 is based on a dimensional rather than a categorical conception of psychological disorder. The assumption on which the DASS-21 development was based (and which was confirmed by the research data) is that the differences between the depression, anxiety, and stress experienced by normal subjects and clinical populations are essentially differences of degree. The DASS-21, therefore, has no direct implications for the allocation of patients to discrete diagnostic categories postulated in classificatory systems such as the DSM and ICD. Item 1,6,8,11,12,14,18 belong to Stress Subscale; Item 2,4,7,9,15,19,20 belong to Anxiety Subscale; Item 3,5,10,13,16,17,221 belong to Depression Subscale.

Recommended cut-off scores for conventional severity labels (normal, moderate, severe) are as follows:

NB Scores on the DASS-21 will need to be multiplied by 2 to calculate the final score.

	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely Severe	28+	20+	34+

A native Chinese fluent in English translated the English SAS-SV into Chinese with local adaptations. At the same time, it mainly refers to Xueting Zhou's doctoral

dissertation “Research on the Relationship among Parenting Style, College Students’ Perfectionism and Mental Health” included in the “Chinese Doctoral Dissertations Full-text Database”. The Chinese version has been used in her paper to ensure the reliability of the questionnaire.

3.8 Data

3.8.1 Data Collection

The data collection was self-administered questionnaires online. Information on Contacting and Accessing to the Research Participants:

1. The researcher sent a request letter to the Ethics Committee of Inner Mongolia Medical University.
2. The researcher used a random sampling method to choose 500 students.
3. After the research was approved by the Ethics Committee of Inner Mongolia Medical University, a list of students will be arranged by the Administration.
4. The researcher sent out five online forms by “Questionnaire Star” to the administrators to pass along to the students, which are 1) Demographic Characteristics questionnaires, 2) Smartphone use behaviors, 3) SAS-SV questionnaire, 4) Life experience during COVID-19 questionnaire, and 5) Depression Anxiety and Depression Scale (DASS-21) Questionnaire. However, the students can make a decision whether they want to participate in the project. If the students are interested in participating in the study, then they can answer the questionnaires online.
5. After the participants answer all the forms and read the Letter of Consent, and then the students need to submit all of the forms (which including the Participation Information Sheet, Letter of Consent, and Questionnaire) back to the researcher online.

6. The students had been verbally explained about the research study and asked to sign the Letter of Consent before taking any further steps of the study.
7. After the researcher received the Letter of Consent. Then the research proceeded to conduct questionnaires for the students.
8. Before the students take the questionnaire, the researcher verbally explained the importance of the study to the participants and asked them to cooperate by answer the questionnaire truthfully. Therefore, the researcher was able to use information that was collected from the participants.
9. Once the questionnaires have been submitted by the participants (Inner Mongolia Medical University students), all the questionnaires and any information related to the study were kept confidential, and they were terminated once the study is complete.

3.8.2 Data analysis

Firstly, descriptive statistics, including mean, frequency, and percentage, were used to show the demography and results of participants. The independent variables of gender, faculty, major, grade, GPA, monthly allowance, BMI, residence (come from urban or rural), physical exercises (how many minutes spend on physical exercises, how often do exercises per week and which kind physical exercises), smoking and drinking alcohol were performed stratified descriptive analysis. GPA level: less than 1.99,1.99-2.99, more than 3. monthly allowance level: low level (0-1000yuan), middle level (1001-2000), high level (2000+yuan). BMI was divided into Underweight (less than 18.5), Normal weight (18.5-24.9), overweight (25-29.9),Obesity(more than 30) four groups. Drinking alcohol is divided into “yes” or “no” two groups. Smoking divided into “yes”, “no”, “no, but used to” three groups.

Secondly, the smartphone addiction and DASS-21 score were analyzed as

classified analysis.

Finally, Simple logistic regression and multivariable logistic regression for controlling confounding factors were utilized to obtain an association between smartphone addiction and depression, stress and anxiety.

3.9 Ethical considerations

Ethical approval was obtained from Inner Mongolia Medical University Ethical Committee.

All participants received an online survey content notification form. All participants were informed of the content and purpose of the questionnaire, and the confidentiality of the information of each participant weas guaranteed. The data survey results also were anonymous.

CHAPTER IV

RESULTS

Based on the previous chapters on research methods, this section clarifies the research results and discussions.

4.1 Descriptive Analyses

This study randomly selected 5 colleges of Inner Mongolia Medical University (School of Traditional Chinese Medicine, School of Erdos Clinical Medicine, School of Health Management, School of Public Health, School of Pharmacy), and randomly selected 100 students from each college for a total of 500 students. In the questionnaire survey (33.6% of males and 66.4% of females), the mean age was 20.70±1.61 years，The age range of participants was 18 to 28 years old. The distribution of participants according to grade: 31.2% (156) of the sample was year 1, 39% (195) of the sample was year 2, 23.4% (117) of the sample was year 3-4, and 6.4% (32) of sample was year 5. The residence of 284 (56.8%) come from urban. Almost students' GPA was 2.00-2.99 (56.8%). There were 76 (15.2%) samples' monthly allowance was less than1000 yuan, 383 (76.6%) was 1000-2000 yuan, and 41 (8.2%) was more than 2000 yuan. The distribution of samples according to BMI: 71 (14.2%) of those was overweight, 288 (57.6%) was normal weight, 77 (15.4%) was overweight and 64 (12.8%) was obese. The majority of sample was never smoking, only 16 (3.2%) were smoking and 15 (3.0%) were not smoking now but used to smoking. Of participants, 257 (51.4%) were not alcohol drinking, and 243 (48.6%) were alcohol drinking in the past 12 months of those, the frequency of drinking per month was more than 3 times were 10 (4.12%), 1-2 times were 34 (13.99%), and less

than 1 time in a month were 199 (81.89%). There were 294 (58.8%) participants did not do physical exercises and 206 (41.2%) did physical exercises, most of them chose to run more than three times a week and more than half an hour each time. Almost 277 (55.4%) can be considered as smartphone addiction. Moreover, there was 105 (21%) participates considered depression, 153(30.6%) considered anxiety, 69(13.8%) considered stress.

In the questionnaire survey which about smartphone use behaviors, there were 425 (85%) participants who choose to social communication (talking and chatting), 231 (46.2%) for watching movies, 324 (64.8%) for listening to music, 224 (44.8%) for playing games,219(43.8) for searching for education knowledge, 345 (69.0%) for studying online classes, 146 (29.2%) for reading news coverage and 20 (4.0%) for others which is for instance shopping, reading novels and so on about reason for using smartphone. The distribution of participants according to the frequency of use smartphone every week: 490 (98%) participants were every day, 3 (0.6%) were 5-6 days and 10 (2.0%) was 1-6 days. 55 (11.0%) of duration of smartphone use every day in the weekday were less than 3 hours, 220 (44.0%) were 3-5 hours, and 225 (45%) were more than 5 hours. The distribution of participants according to the duration of smartphone use every day on weekend: 27 (5.4%) participants were less than 3 hours, 134 (26,8%) were 3-5 hours, and 339 (67.8%) were more than 5 hours.

Table 4.3 shows in regards to depression, those classified as ups/downs to be normal were 395 (79.0%), mild was 45 (9.0%), moderate was 46 (9.2%), severe were 6 (1.2%), extremely were 8 (1.6%). In regards to stress, those classified as ups/downs to be normal were 431 (86.2%), mild was 38 (7.6%), moderate was 19 (3.8%), severe were 6 (1.2%), extremely were 6 (1.2%). In regards to anxiety, those classified as ups/downs to be normal were 347 (69.4%), mild was 24 (4.8%), moderate was 89 (17.8%), severe were 25 (5.0%), extremely were 15 (3.0%).

Table 4.4 shows life experience during the COVID-19 pandemic: there was not a participant to report being positive for COVID-19 or know of others who had been

sick with COVID-19. There were 251 (50.2%) participants to choose the way which find out about COVID-19 by word of mouth, 404 (80.8%) from a newspaper (in print or online),421 (84.2%) from social media, and 50 (10.0%) from a TV broadcast. None of the 500 participants or anyone they knew had been infected with COVID-19. The majority of participants had taken some preventive measures, only 55 (11.0%) had not taken any preventive measures, 445 (89.0%) had taken some preventive measures, 374 (84.0%) of who had taken preventive measures avoided leaving home in case of infection, 443(99.6%) of who had taken preventive measures wore a mask in case of infection, 444 (99.8%) of who had taken preventive measures washed hand frequently in case of infection and kept a social distance from others in case of infection. 27 (49.0%) of who had not taken preventive measures did not feel the virus will affect them, 20 (4.0%) who had not taken preventive measures lacked the resources (such as mask and alcohol). There were 215 (43%) participants who felt they were at greater of contracting COVID-19, 203 (40.6%) participants felt if they have an underlying health condition, their condition will make them more likely to suffer from complications if they contract COVID-19, 134 (26.8%) participants had concerns about transportation,161 (32.2%) participants had concerns about interacting with others in a social setting,134 (26.8%) participants had concerns about access to healthcare, 108 (21.6%) participants had concerns about access to food and groceries, 147 (29.4%) participants had concerns about maintaining their schooling,193(38.6%) participants had concerns about access to accurate information about the virus, 117 (23.4) participants had more anxiety, fear, concern about their health since COVID-19,434 (86.8%) participants would seek medical care if they developed COVID-19 symptoms(cough, sore throat, fever).

Table 1 **Demographic characteristics of study participants(n=500)**

Demographic characteristics	n(%)
Age (years)	
18	22（4.4）
19	94（18.8）
20	141（28.2）
21	94（18.8）
≥22	149（29.8）
Mean (SD)	20.7 (1.61)
Range	18-28
Gender	
Male	168(33.6)
Female	332(66.4)
Faculty	
Traditional Chinese Medicine	100(20.0)
Health Management	100(20.0)
Public Health	100(20.0)
Pharmacy	100(20.0)
E'erduosi Clinical Medicine	100(20.0)
Study year	
Year 1	156(31.2)
Year 2	195(39.0)
Year 3-4	117(23.4)
Year 5	32(6.4)
GPA	
≤1.99	92(18.4)
2.00-2.99	284(56.8)

Demographic characteristics	n(%)
≥3.00	124(24.8)
BMI	
Underweight	71(14.2)
Normal weight	288(57.6)
Overweight	77(15.4)
Obesity	64(12.8)
Alcohol Drinking (past 12 months)	
Yes	243(48.6)
No	257(51.4)
Monthly Allowance （yuan）	
≤1000	76（15.2）
1000-2000	383（76.6）
≥2000	41（8.2）
Residence	
Urban	284(56.8)
rural	216(43.2)
Physical Exercises	
Yes	206(41.2)
No	294(58.8)
Smoking	
Yes	16(3.2)
No, but used to	15(3.0)
No	469(93.8)
Frequency of smoking per week	
Every day	11(68.75)
5-6 days	1(6.25)

Demographic characteristics	n(%)
3-4 days	1(6.25)
1-2 days	0(0)
Less than 1 day	3(18.7)
Alcohol Drinking (past 12 months)	
Yes	243(48.6)
No	257(51.4)
Frequency of drinking (per month/time)	
≥3	10(4.12)
1-2	34(13.99)
<1	199(81.89)

Table 2 **Smartphone using behaviors of study participants**

Smartphone using behaviors	n(%)
Reason for using smartphone	
Social communication (talking, chatting) (n=500)	425(85%)
Watch movies(n=500)	231(46.2)
Listen to the music(n=500)	324(64.8)
Play games(n=500)	224(44.8)
Search for education knowledge(n=500)	219(43.8)
Study online classes(n=500)	345(69.0)
Read news coverage(n=500)	146(29.2)
Others，such as shopping, reading novels and so on(n=500)	20(4.0)
Frequency of use smartphone (per week)	
Every day	490(98.0)

Smartphone using behaviors	n(%)
1-6 days	10(2.0)
Duration of smartphone use per day/weekday	
⩽3 hours	55(11.0)
3-5 hours	220(44.0)
⩾5 hours	225(45.0)
Duration of smartphone use per day/weekend	
⩽3 hours	27(5.4)
3-5 hours	134(26.8)
⩾5 hours	339(67.8)

Table 3 **Mental health and Smartphone addiction**

Mental health and Smartphone addiction	n(%)
Depression	
Normal	395(79.0)
Mild	45(9.0)
Moderate	46(9.2)
Severe	6(1.2)
Extremely	8(1.6)
Anxiety	
Normal	347(69.4)
Mild	24(4.8)
Moderate	89(17.8)
Severe	25(5.0)
Extremely	15(3.0)
Stress	

Mental health and Smartphone addiction	n(%)
Normal	431(86.2)
Mild	38(7.6)
Moderate	19(3.8)
Severe	6(1.2)
Extremely	6(1.2)
Smartphone addiction	
No	223（44.6）
Yes	277（55.4）

Table 4 **Life experience during COVID-19 pandemic of study participants**

Life experience during COVID-19 pandemic	n(%)
How did you find out about the COVID-19 pandemic? (You can choose more than 1 answers)	
By word of mouth	251(50.2)
From newspaper (in print or online)	404(80.8)
From social media	421(84.2)
From TV broadcast	50(10.0)
Have you been infected with COVID-19?	
Yes	0(0)
No	500(100.0)
Do you know anyone who has been sick with COVID-19?	
Yes	0(0)
No	500(100.0)
Have you taken any preventive measures?	
Yes	445(89.0)
No	55(11.0)

Life experience during COVID-19 pandemic	n(%)
If yes, avoid leaving the home in case of infection(n=445)	
Yes	374(84.0)
No	71(16.0)
If yes, wearing a mask in case of infection(n=445)	
Yes	443(99.6)
No	2(0.4)
If yes, washing hand frequently in case of infection(n=445)	
Yes	444(99.8)
No	1(0.2)
If yes, social distancing from others in case of infection(n=445)	
Yes	415(93.3)
No	30(6.7)
If not, because I do not feel the virus will affect me(n=55)	
Yes	27(49)
No	28(51)
If not, because I lack the resources (such a mask, alcohol…) (n=55)	
Yes	5(9.1)
No	50(90.9)
Do you feel you are at greater risk of contracting COVID-19?	
Yes	20(4.0)
No	480(96.0)
Do you feel you are at greater risk of poor outcomes if you contract COVID-19?	
Yes	215(43.0)
No	285(57.0)
If you have an underlying health condition, do you feel your condition makes you more likely to suffer from complications if you contract COVID-19?	

Life experience during COVID-19 pandemic	n(%)
Yes	203(40.6)
No	297(59.4)
Do you have concerns about transportation?	
Yes	134(26.8)
No	366(73.2)
Do you have concerns about interacting with others in a social setting?	
Yes	161(32.2)
No	339(67.8)
Do you have concerns about access to healthcare?	
Yes	134(26.8)
No	366(73.2)
Do you have concerns about access to food and groceries?	
Yes	108(21.6)
No	392(78.4)
Do you have concerns about maintaining your schooling?	
Yes	147(29.4)
No	353(70.6)
Do you have concerns about access to accurate information about the virus?	
Yes	193(38.6)
No	307(61.4)
Since COVID-19 began, have you had more anxiety, fear, concern about your health?	
Yes	117(23.4)
No	383(76.6)
If you developed COVID-19 symptoms (cough, sore throat, fever), would you seek medical care?	

Life experience during COVID-19 pandemic	n(%)
Yes	435(87.0)
No	65(13.0)

4.2 Univariate analyses

In this research, we used simple logistical regression to do univariate analyses. Table 4.5 presented the univariate analysis of the factors associated demographic characteristics with depression. It showed there was the relationship between gender (Unadjusted OR=2.37), residence (Unadjusted OR=1.76), monthly allowance (Unadjusted OR=0.32), smartphone addiction (Unadjusted OR=4.18), and depression.

Like depression, table 4.6 presented the univariate analysis of the factors associated demographic characteristics with anxiety. It showed there was the relationship between gender (Unadjusted OR=1.75), GPA (Unadjusted OR=2.37), smoking (Unadjusted OR=4.00), monthly allowance (Unadjusted OR=0.42), smartphone addiction (Unadjusted OR=6.05), and anxiety.

In the same situation of stress, table 4.7 presented the univariate analysis of the factors associated demographic characteristics with stress. It showed there was the relationship between gender (Unadjusted OR=1.88), monthly allowance (Unadjusted OR=0.31), smartphone addiction (Unadjusted OR=4.09), and stress.

Table 5 **Association between demographic characteristics and depression**

Characteristics		**Unadjusted OR (95%CI)**	**p-value**
Gender			
	Male	2.37(1.52– 3.66)	<0.001
	Female	Ref.	
Age (Years)			
	18	Ref.	
	19	0.92(0.28 – 3.09)	0.897
	20	1.17(0.366– 3.71)	0.796
	21	0.85(0.253– 2.88)	0.800
	≥22	1.71(0.55– 5.35)	0.358
Education			
	Year 1	Ref.	
	Year 2	1.02(0.60-1.73)	0.957
	Year 3-4	1.26(0.70-2.64)	0.440
	Year 5	1.91(0.82-4.45)	0.135
GPA			
	≤1.99	Ref.	
	2.00-2.99	1.69(0.90-3.17)	0.105
	≥3.00	1.41(0.69-2.89)	0.352
BMI			
	Underweight	Ref.	
	Normal weight	1.41(0.70-2.84)	0.343
	Overweight	1.79(0.78-4.08)	0.168
	Obesity	1.82(0.77-4.28)	0.171

Characteristics		Unadjusted OR (95%CI)	p-value
Monthly Allowance （yuan）			
	≤1000	Ref.	
	1000-2000	0.32(0.19-0.54)	<0.001
	≥2000	0.43(0.18-1.03)	0.058
Residence			
	Urban	Ref.	
	rural	1.76(1.14-2.72)	0.010
Physical Exercises			
	Yes	Ref.	
	No	1.18(0.76-1.83)	0.467
Smoking			
	Yes	4.15(1.52-11.36)	0.006
	No, but used to	2.77(0.96-7.98)	0.059
	No	Ref.	
Alcohol Drinking (past 12 months)			
	Yes	1.22(0.80-1.88)	0.359
	No	Ref.	
Smartphone addiction			
	Yes	4.18(2.49-7.02)	<0.001
	No	Ref.	

Table 6 **Association between demographic characteristics and Anxiety**

Characteristics		**Unadjusted OR (95%CI)**	**p-value**
Gender			
	Male	1.75(1.18– 2.60)	0.005
	Female	Ref.	
Age (Years)			
	18	Ref.	
	19	1.44(0.49 – 4.29)	0.510
	20	1.44(0.50– 4.17)	0.498
	21	1.44(0.49– 4.29)	0.510
	≥22	1.72(0.60– 4.92)	0.314
Study year			
	Year 1	Ref.	
	Year 2	0.83 (0.53-1.32)	0.434
	Year 3-4	0.98(0.58-1.64)	0.940
	Year 5	1.11(0.49-2.47)	0.798
GPA			
	≤1.99	Ref.	
	2.00-2.99	1.75(1.02-3.03)	0.043
	≥3.00	1.33(0.71-2.48)	0.371
BMI			
	Underweight	Ref.	
	Normal weight	1.17(0.65-2.09)	0.607
	Overweight	1.10(0.53-2.25)	0.806
	Obesity	1.87(0.91-3.86)	0.090

Characteristics		Unadjusted OR (95%CI)	p-value
Monthly Allowance （yuan）			
	≤1000	Ref.	
	1000-2000	0.42(0.25-0.69)	0.001
	≥2000	0.46(0.21-1.03)	0.060
Residence			
	Urban	Ref.	
	rural	1.25(0.86-1.84)	0.248
Physical Exercises			
	Yes	Ref.	
	No	1.04(0.71-1.53)	0.838
Smoking			
	Yes	4.00(1.43-11.21)	0.008
	No, but used to	1.20(0.40-3.53)	0.744
	No	Ref.	
Alcohol Drinking (past 12 months)			
	Yes	1.30(0.89-1.90)	0.178
	No	Ref.	
Smartphone addiction			
	Yes	6.05(3.79-9.66)	<0.001
	No	Ref.	

Table 7 **Association between demographic characteristics and Stress**

Characteristics		**Unadjusted OR (95%CI)**	**p-value**
Gender			
	Male	1.88 (1.12 – 3.14)	0.017
	Female	Ref.	
Age (Years)			
	18	Ref.	
	19	1.95(0.23 – 16.49)	0.538
	20	3.88(0.50– 30.37)	0.196
	21	2.22(0.27– 18.53)	0.460
	≥22	5.08(0.66– 39.30)	0.120
Study year			
	Year 1	Ref.	
	Year 2	1.32(0.67-2.61)	0.426
	Year 3-4	2.42(1.20-4.86)	0.013
	Year 5	2.16(0.77-6.10)	0.143
GPA			
	≤1.99	Ref.	
	2.00-2.99	1.42(0.68-2.96)	0.346
	≥3.00	1.30(0.57-3.00)	0.533
BMI			
	Underweight	Ref.	
	Normal weight	0.71 (0.34-1.48)	0.355
	Overweight	1.11(0.46-2.66)	0.819
	Obesity	1.26(0.51-3.09)	0.616

Characteristics		Unadjusted OR (95%CI)	p-value
Monthly Allowance （yuan）			
	≤1000	Ref.	
	1000-2000	0.31(0.17-0.57)	<0.001
	≥2000	0.54(0.21-1.40)	0.058
Residence			
	Urban	Ref.	
	rural	1.01(0.61-1.70)	0.960
Physical Exercises			
	Yes	Ref.	
	No	1.72(1.00-2.97)	0.052
Smoking			
	Yes	2.15(0.67-6.87)	0.197
	No, but used to	0.99(0.22-4.50)	0.991
	No	Ref.	
Alcohol Drinking (past 12 months)			
	Yes	0.91(0.55-1.52)	0.717
	No	Ref.	
Smartphone addiction			
	Yes	4.09 (2.17-7.70)	<0.001
	No	Ref.	

4.3 Multivariable Logistic Regression Analyses

The findings indicated that the smartphone addicted users tend to experience a 4.53 times higher depression than those non-addicted after adjusting for gender, monthly allowance, residence, and smoking (OR=4.53, 95%CI=2.63 – 7.81); the smartphone addicted users tend to experience a 6.47 times higher anxiety than those non-addicted after adjusting for gender, GPA, BMI, monthly allowance, and smoking (OR=6.47, 95%CI=3.97 – 10.55); the smartphone addicted users tend to experience a 4.05 times higher stress than those non-addicted after adjusting for gender, study year, and monthly allowance (OR=4.05, 95%CI=2.12 – 7.71) (Table 4.8-4.10).

Table 8 **The association between depression and smartphone addiction**

Smartphone Addiction	**Non-depression**	**Depression**	**Unadjusted OR (95%CI)**	**p-value**	**Adjusted OR (95%CI)**	**p-value**
No	202(40.4)	21(4.20)	Ref.		Ref.	
Yes	193(38.6)	84(16.8)	4.19 (2.45 – 7.02)	<0.001	4.53 (2.63– 7.81)	<0.001

***Each OR is adjusted for gender, monthly allowance, residence, and smoking.**

Table 9 **The association between Anxiety and smartphone addiction**

Smartphone Addiction	**Non-anxiety**	**Anxiety**	**Unadjusted OR (95%CI)**	**p-value**	**Adjusted OR (95%CI)**	**p-value**
No	196(39.2)	27(5.4)	Ref.		Ref.	
Yes	151(30.2)	126(25.2)	6.06 (3.80– 9.66)	<0.001	6.47 (3.97– 10.55)	<0.001

***Each OR is adjusted for gender, GPA, BMI, monthly allowance, and smoking.**

Table 10 **The association between Stress and smartphone addiction**

Smartphone Addiction	**Non-stress**	**Stress**	**Unadjusted OR (95%CI)**	**p-value**	**Adjusted OR (95%CI)**	**p-value**
No	210(42.0	13(2.60)	Ref.		Ref.	
Yes	56(11.2)	84(16.8)	4.09 (2.18 – 7.70)	<0.001	4.05 (2.12– 7.71)	<0.001

***Each OR is adjusted for gender, study year, and monthly allowance.**

CHAPTER V

DISCUSSION

5.1 Discussion

The purpose of this study is to explore the relationship between smartphone addiction and mental health of Inner Mongolia Medical University Students during the prevalence of COVID-19 in 2021. In this study on the undergraduates of Inner Mongolia Medical University during the prevalence of COVID-19 in 2021, 21% of the students had different degrees of depression, 30.6% of the students had different degrees of anxiety, and 13.8% of the students had different degrees of stress. This is also basically consistent with the results of Wen Zeng's study on the prevalence of mental health problems among Chinese medical students. The prevalence of depression, anxiety, suicidal thoughts, and eating disorders is 29%, 21%, 11%, and 2%, respectively (Zeng et al., 2019). It is pointed out in the relevant report that the incidence of mental health problems of college students is between 3% - 10%, which has become the main reason for college students to drop out and suspend school, accounting for 30% - 60% of the overall drop out and suspension (Yang et al., 2014). The rich functions of smartphones not only enable people to quickly and timely obtain external information, but also a tool for people to kill time. People are immersed in their rich functions. Moreover, in the process of using smartphones, their rich functions provide them with a comfortable virtual world without any setbacks, which makes college students with weak self-control more like to indulge in them, Escapism, resulting in the increase of use behavior such as use frequency and use time, has formed a vicious circle, which may also be related to mental health.

COVID-19 is known to lead to increased risk factors for mental health. In

addition, unpredictability and uncertainty, blockade, and isolation may lead to social isolation, loss of income, loneliness, lack of activity, limited access to basic services, increased access to food, alcohol and online gambling, and reduced family. and social support. Thus, it has a harmful impact on physical and mental health and quality of life (Moreno et al., 2020). In this study, 500 participants had not been infected, or people they were familiar with had been infected with COVID-19, and most of them learned COVID-19 related information through Internet news and other channels. Most students can take self-protection measures, such as washing hands frequently, reducing going out, maintaining social distance and so on. Only a few students think they will not be infected and do not pay enough attention to protection measures. In response to the -19 pandemic of COVID-19, the National Health Council of China issued the “basic principles of emergency psychological crisis intervention” on January 26, 2020. China's Ministry of education has issued an official document on January 28, 2020 to support colleges and universities to provide psychological assistance hotlines. So far, there are still little epidemiological data on college students' mental health problems and mental diseases (Chang et al., 2020). A recent study on the prevalence of anxiety among China's college students shows that stressors, including daily life and academic delay, are positively correlated with the level of anxiety symptoms, which indicates that the mental health of college students may be affected by public health emergencies in COVID-19 (Cao et al., 2020). The problems in this study also illustrate the vulnerability of Inner Mongolia medical university students to COVID-19 and provide empirical evidence for solving the psychological intervention of public health risk perception during the epidemic. To a certain extent, psychosocial support and targeted interventions to college students are crucial during the COVID-19 pandemic. Thanks to the timely and effective measures taken by the Chinese government to deal with covid-19 pandemics and the full cooperation of the Chinese people, the epidemic situation in China has been effectively controlled in 2021 after experiencing active and effective prevention and

control measures such as blockade, isolation, full rescue, development, and injection of vaccines. Therefore, for students of Inner Mongolia Medical University, although epidemic prevention cannot be ignored. However, its physical and mental impact is much smaller than that in 2020. Although some students have relatively negative ideas about obtaining medical security, ensuring their studies, social distance, transportation, obtaining information about the epidemic situation, infection risk, adverse results caused by infection, and aggravating basic diseases, which will have a certain impact on their mental health, However, in the face of the relevant knowledge of COVID-19, most students can correctly and actively deal with it.

To explore the correlation, binary logistic regression analyses were used to analyze the correlation between mental health and demographic characteristics of undergraduates in Inner Mongolia Medical University. It was found that gender, monthly allowance, whether smoking and so on had significant differences in depression, anxiety, and stress. Whether smartphone addiction also has significant differences in depression, anxiety, and stress performance. In further multivariate analyses, Using the method of logistic regression analyses, all the factors affecting the mental health of undergraduates in Inner Mongolia Medical University were put into the model in the single factor analysis. It was found that the mental health status of different genders was inconsistent with the results of some studies . Men and women experience different kinds of mental health problems. While women exceed men in internalizing disorders such as depression and anxiety, men exhibit more externalizing disorders such as substance abuse and antisocial behavior (Rosenfield and Mouzon 2013). They believe that females are more likely to suffer from mental health problems such as mild depression than males, which may be because women are more sensitive and more vulnerable to stress. The reason for the inconsistency may be that the survey method used in this study is relatively simple, and the gender differences in mental health status such as depression need to be further investigated. Consistent with previous studies, adolescent smoking is associated with depression, but the

direction of causality is not clear. According to the data of the National Longitudinal Alcohol epidemic survey in 1992, there is a significant and positive relationship between the early start of regular smoking (smoking before the age of 13) and the lifelong diagnosis of major depression (Hanna & Grant, 1999). On the other hand, an Australian statewide survey of adolescents in 60 randomly selected schools found that depression and anxiety, as well as peer smoking, predicted the beginning of experimental smoking. Conversely, experimental smokers are 29 times more likely to transition to daily smoking in the next 6 months than non-smokers. Little is known about the relationship between smoking and mental health problems, but more and more evidence shows that the rate of mental comorbidity of adolescent smokers is very high (Chang et al., 2005). In this study, monthly allowance also has a certain impact on mental health. Students with low monthly allowance have a higher risk of depression, anxiety, and stress than students with medium and high levels. In the research of Xinwei Liu et al., there is a certain correlation between College Students' mental health and family economic income. The proportion of students whose family per capita income level cannot meet the needs of daily life with mental health problems is obviously too large. Students with low living expenses may be dwarfed by students who are generous and make extensive friends due to a lack of financial strength and more energy for interpersonal communication. They are prone to inferiority complex and lack of interpersonal communication, resulting in depression (Xinwei Liiu, 12,2007).

According to the survey results, the degree of smartphone addiction of students in Inner Mongolia Medical University is 55.4%, which is higher than that of South Korea(Kwon, Kim, et al., 2013) and in Western Europe(Haug et al., 2015; Lopez-Fernandez, 2017) studied by SAS, and 29.8% of Chinese medical students by Baifeng Chen and others' study(Chen et al., 2017). Inner Mongolia is relatively remote and backward, and various cultural and entertainment resources are relatively scarce. The new campus of Inner Mongolia Medical University is far away from the

urban area and located in the suburbs of the city. College students usually live in classrooms, canteens, and libraries. In addition to learning, life is eating and sleeping. However, young people have plenty of experience. In addition to learning, they also need to communicate with friends, leisure, and entertainment. Smartphones meet the needs of young people very conveniently. Therefore, they will relax and relax more through mobile phones and alleviate learning fatigue, which increases the risk of becoming addicted to smartphones. China's smartphone has become popular in early 2020. The Chinese government has adopted the policy of home segregation in the whole country. During the period of the home, online courses, online games, and related activities have been increased, resulting in a significant increase in the utilization rate of mobile phones, and thus the addiction rate of smartphones has been increased. A study showed that there was a certain relationship between smartphone use behavior and smartphone addiction, longer duration of smartphone use on a typical day and reporting that social networking was the most personally relevant smartphone function were associated with smartphone addiction (Haug et al., 2015). In this survey, 85% of the 500 participants said that their main purpose of using smart phones is to socialize. Smartphones have long replaced the traditional face-to-face chat mode and become the main communication mode of Chinese young people. Moreover, in addition to the functions of watching movies, listening to music, playing games, searching knowledge, online courses and obtaining news, browsing short videos. and reading online novels have gradually become the reasons for college students to use smartphones. Smartphones have become an indispensable part of the students of Inner Mongolia Medical University. Among the 500 participants, up to 98% of the students said they use mobile phones every day, and more than half of the students said they use smart phones for more than 5 hours every day, whether on weekends or working days. Obviously, smartphones have increasingly occupied their lives. The increase of these smart phone behaviors has not only become a factor of their smartphone addiction (Lemola et al., 2015), but also led to the decrease of their

social behavior, which is related to sleep disorders and depression (Lin et al., 2014).

The relationship between smartphones and mental health has been discussed in previous studies. In the review of 23 related articles, it has been pointed out that depression and anxiety are related to mobile phone use problems (Elhai et al., 2017). In this study, compared with non-addicts, addiction has a positive correlation with depression, anxiety and stress, the depression risk of smartphone addicts is 4.53 times, anxiety risk of smartphone addicts is 6.47 times, stress risk of smartphone addicts is 4.05 time than that of non-addicts. From the perspective of mental health to mobile phone addiction, some studies have shown that one of the inducing factors of smartphone addiction is the increase of stress level, followed by the decline of self-control level, which leads to the excessive use of smartphones (Cho et al., 2017). Some studies have also pointed out that smartphone addiction is related to type a personality, which may lack positive stress coping mechanism, which makes them very easy to become addicted to smartphones (Park & Lee, 2014). It is also effective to observe the relationship between mental health and smartphone addiction from the opposite perspective. Smartphone addiction may be the inducing factor of mental health problems such as depression, which can act indirectly or as an intermediary. It is also effective to observe the relationship between mental health and smartphone addiction from the opposite perspective. Smartphone addiction may be the inducing factor of mental health problems such as depression, which can act indirectly or as an intermediary (Kim et al., 2017). A research report pointed out that people with low self-perceived emotion or health levels are more likely to become addicted to smartphones, that is, when individuals experience unhappiness, depression, anxiety, stress and other emotional things, they are more likely to become addicted to smartphones (Kim et al., 2019). This shows that these smartphone addicts fall into a vicious circle. They receive the unhealthy pressure of depression and other emotions, try to overcome or alleviate this emotional pressure through excessive use of

smartphones, and do not realize that this addiction itself has a negative impact on their social, emotional and physical health, thus aggravating depression, anxiety, and stress emotional manifestations. An experimental study tried to determine the impact of not using a smartphone for 2 days. This study shows that emotional disorders are associated with depression, stress and anxiety caused by the loss of social media (Elhai et al., 2018).

The positive correlation between smartphone addiction and mental health status such as depression, anxiety, and stress among undergraduates of Inner Mongolia Medical University is worrying. It is suggested to make rational use of smartphones. Local education departments, public health departments, and schools have issued some policies and strategies to change this situation. The relationship between mental health and smart phone addiction is an escalating global problem, which needs further research in this regard in the future.

5.2 Limitations

In this study, 500 students were randomly selected from Inner Mongolia Medical University, so the sample size was small and did not cover all majors of Inner Mongolia Medical University. In addition, in 2021, China's COVID-19 was basically controlled effectively. Students in Inner Mongolia were all returned to normal school in 2020. Although COVID-19 was still popular in 2021, China's basic control was in place. So, the impact of the epidemic on the mental health of students in Inner Mongolia Medical University has declined.

5.3 Conclusion

The positive correlation between smartphone addiction and mental health status such as depression, anxiety, and stress among undergraduates of Inner Mongolia Medical University is worrying. It is suggested to make rational use of smartphones.

Local education departments, public health departments, and schools have issued some policies and strategies to change this situation. The relationship between mental health and smart phone addiction is an escalating global problem, which needs further research in this regard in the future.

5.4 Recommendations

More and more in-depth research is needed on the relationship between smartphone addiction and mental health status. For this study, it has been confirmed that smartphone addiction is positively correlated with depression, anxiety, and stress for undergraduates of Inner Mongolia Medical University. Therefore, Through this study, we hope to suggest that on the one hand, we should increase the education and publicity on the impact of smartphone addiction on mental health, such as holding lectures, distributing brochures, and using school web pages and other online publicity platforms, to make students have a correct understanding of smartphone addiction and mental health, guide students to use smartphones correctly and reasonably, and learn to regulate their emotions; On the other hand, formulate relevant policies, such as not allowing to carry and use mobile phones during class, closing the school wireless network at night, and urging students to strengthen physical exercise.

For more in-depth research, we can further study the smartphone addiction and mental health status of college students in Western China, to provide more comprehensive and powerful evidence, to improve the attention of society and relevant policymakers, to help improve the mental health status of college students.

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Appendix A: Questionnaire (English version)

ASSOCIATION BETWEEN SMARTPHONE ADDICTION AND MENTAL HEALTH DURING THE COVID-19 PANDEMIC 2021 AMONG INNER MONGOLIA MEDICAL UNIVERSITY STUDENTS, THE PEOPLE'S REPUBLIC OF CHINA

Questionnaire

CONFIDENTIALITY: This survey data is only used for exploring the research of "Association between Smartphone Addiction and Mental Health During the COVID-19 Pandemic Among Inner Mongolia Medical University Students, China in 2021". Single item investigation data concerning any individual or his/her family shall not be divulged without the consent of the said person.

Introduction to this study

The purpose of this questionnaire is to collect the dependence on mobile phone application, demographic information, and mental health status of students in Inner Mongolia Medical University during the epidemic period, especially in the three aspects of depression, anxiety and stress, so as to explore the mental health relationship between smart phone addiction and depression, anxiety and stress of students in Inner Mongolia Medical University It provides a systematic and scientific data source for academic research and a scientific basis for relevant policy-making departments.

We are very sorry for the inconvenience caused to you. Please understand and help us with our work.

Any information you provide will be kept confidential without your permission. And this data survey is anonymous. The information released by scientific research, policy analysis and opinion review is the summary information of a large number of questionnaires, not your personal case information, and does not involve the disclosure of your personal and family information.

The investigation is exploratory and has been approved by the ethics committee of Inner Mongolia Medical University. The personnel participating in the investigation and research will strictly abide by the principle of confidentiality.

Thank you very much for your support and help!

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COVERSCREEN

Find the students of Inner Mongolia Medical University who have smart phones to do the following questionnaire. If any of the following questions is answered no, the rest of the questionnaire will not be conducted.

Cov1. Are you a student of Inner Mongolia Medical University now?

1. Yes.	Continue
2. No.	Quit

Cov2. Do you have smartphone?

1.Yes.	Continue
3. No.	Quit

Questionnaire 1: Demographic characteristics

Please fill in according to your own actual situation.

1. Your age is _____years old.

2. What is your gender?

A. Male

B. Female

3. What is your faculty?_____

4. What is your major? _____

5. Which year are you?

A. 1st year student
B. 2nd year student
C. 3rd year student
D. 4th year student
E. 5th year student

6. What is your last term's GPA ?_____

7. What is your monthly allowance?

……Yuan

A. Less than 1000 Yuan

B. 1000-2000 Yuan

C. More than 2000 Yuan

7. Where are you from?

A. Urban area

B. Rural area

9. Do you usually do physical exercises?

A. Yes (please answer item 10)

B. No (please skip item 10)

10. If yes,

10.1 Which kind of physical exercises……..

10.2 How often do you exercise per week……..time/week

10.3 How long does it take to do physical exercises?.....hour ……minutes.

11. What is your height?.....cm.

12. How much do you weight?.....kg.

13. Do you smoke?

A. Yes, I do (please answer item 14)

B. No, I'm not, but I used to smoke (please skip item 14)

C. No, I don't (please skip item 14)

14. If you do smoke, how often?

A. Every day

B. 5-6 days per week

C. 3-4 days per week

D. 1-2 days per week

E. Less than once a week

15. In the past 12 months, do you drink alcohol?

    A. Yes (please answer item 16)

    B. No (please skip item 16)

16. If you drink alcohol, how often?

    A. >5 times a month

    B. 3-4 times a month

    C. 1-2 times a month

    D. < Once a month

Questionnaire 2: Smartphone use behavior

1. How often do you use smartphone a week?
   A. Everyday
   B. 5-6 day per week
   C. 4-5 day per week
   D. 2-3 day per week
   E. Once per week
   F. < once per week
2. During weekdays, how long do you use smartphone per day?.....hour……..min.
3. During weekends, how long do you use smartphone per day?.....hour……..min.

4. What is your main reasons in using smartphone? (Choose not more than 3 answers)

A. To have social communication (talking, chatting)

B. To watch movies

C. To listen to the music

D. To play games

E. To search for educational knowledge

F. To study online class

G. To Read news coverage

H. Others (please specify)……

Questionnaire 3: Smartphone Addiction Scale: Short Version (SAS-SV) (10 questions)

Smartphone Addiction Scale: Short Version (SAS-SV) (10 questions)						
Explanation Please carefully read each passage and mark ✓ in a box of 1, 2, 3, 4, 5, or 6 which identify the message that is most relevant to you from your present situations However, there is no right or wrong answer, and you should not spend too much time on each passage Rating Scale: 1 – Strongly Disagree 2 – Disagree 3 – Weakly Disagree 4 – Weakly Agree 5 – Agree 6 – Strongly Agree						
From your current situation, how much do you agree with the following statement?	Strongly Disagree (	Disagree (	Weakly Disagree (	Weakly (	Agree (	Strongly Agree (6)
1. Missing planned work due to smartphone use						
2. Having a hard time concentrating in class, while doing assignments, or while working						

due to smartphone use						
3. Feeling pain in the wrists or at the back of the neck while using a smartphone						
4. Won't be able to stand not having a smartphone						
5. Feeling impatient and fretful when I am not holding my smartphone						
6. Having my smartphone in my mind even when I am not using it						
7. I will never give up using my smartphone even when my daily life is already greatly affected by it.						
8. Constantly checking my smartphone so as not to miss conversations between other people on Twitter or Facebook						
9. Using my smartphone longer than I had intended						
10. The people around me tell me that I use my smartphone too much						

Questionnaire 4: Life experience during COVID-19 Questionnaire

1. How did you find out about the COVID-19 pandemic? (You can choose more than 1 answers)

A. By word of mouth

B. From newspaper (in print or online)

C. From social media

D. From TV broadcast

2. Have you been infected with COVID-19?

A. Yes

B. No

3. Do you know anyone who has been sick with COVID-19?

A. Yes

B. No

C. I am not sure

4. Have you taken any preventive measures?

A. Yes (please answer item 5.1-5.4)

B. No (please skip to do item 6.1-6.2)

If yes, please answer item 5.1-5.4

5.1 Avoid leaving the home

A. Yes

B. No

5.2 Wearing a mask

A. Yes

B. No

5.3 Washing hand frequent

A. Yes

B. No

5.4 Social distancing from others

A. Yes

B. No

If not, please answer item 6.1-6.2

6.1 I do not feel the virus will affect me

A. Yes

B. No

6.2 I lack the resources (such a mask, alcohol,…)

A. Yes

B. No

7. Do you feel you are at greater risk of contracting COVID-19?

A. Yes

B. No

8. Do you feel you are at greater risk of poor outcomes if you contract COVID-19?

A. Yes

B. No

9. Do you feel that you are at greater risk of contracting COVID-19 or suffering worse disease?

A. Yes

B. No

10. If you have an underlying health condition, do you feel your condition makes you more likely to suffer from complications if you contract COVID-19?

A. Yes

B. No

11. Do you have concerns about transportation?

A. Yes

B. No

12. Do you have concerns about interacting with others in a social setting?

A. Yes

B. No

13. Do you have concerns about access to healthcare?

A. Yes

B. No

14. Do you have concerns about access to food and groceries?

A. Yes

B. No

15. Do you have concerns about maintaining your schooling?

A. Yes

B. No

16. Do you have concerns about access to accurate information about the virus?

A. Yes

B. No

17. Since COVID-19 began, have you had more anxiety, fear, concern about your health?

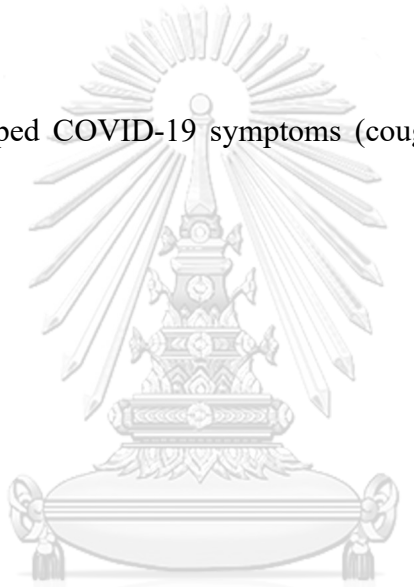
A. Yes

B. No

18. If you developed COVID-19 symptoms (cough, sore throat, fever), would you seek medical care?

A. Yes

B. No



Questionnaire 5: Depression Anxiety Stress Scales (DASS-21) 21 questions

Depression Anxiety Stress Scales (DASS-21) 21 questions				
Explanation Please carefully read each passage and mark ✓ in a box of 0, 1, 2, or 3 which identify the message that is most relevant to you *in the past week.* However, there is no right or wrong answer, and you should not spend too much time on each passage Rating Scale: 0 – Did not apply to me at all 1 – Applied to me to some degree, or some of the time 2 – Applied to me a considerable degree or a good part of time 3 – Applied to me very much or most of the time				
In the past week…	Did not apply to me at all (0)	Applied to me to some degree, or some of the time (1)	Applied to me a considerable degree or a good part of time (2)	Applied to me very much or most of the time (3)
1. I found it hard to wind down				
2. I was aware of dryness of my mouth				
3. I couldn't seem to experience any positive feeling at all				

4. I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)				
5. I found it difficult to work up the initiative to do things				

In the past week…	Did not apply to me at all (0)	Applied to me to some degree, or some of the time (1)	Applied to me a considerable degree or a good part of time (2)	Applied to me very much or most of the time (3)
6. I tended to over-react to situations				
7. I experienced trembling (e.g. in the hands)				
8. I felt that I was using a lot of nervous energy				
9. I was worried about situations in which I might panic and make a				

fool of myself				
10. I felt that I had nothing to look forward to				
11. I found myself getting agitated				
12. I found it difficult to relax				
13. I felt down-hearted and blue				
14. I was intolerant of anything that kept me from getting on with what I was doing				
15. I felt I was close to panic				
16. I was unable to become enthusiastic about anything				

In the past week…	Did not apply to me at all (0)	Applied to me to some degree, or some of the time (1)	Applied to me a considerable degree or a good part of time (2)	Applied to me very much or most of the time (3)
17. I felt I wasn't worth much as a person				

18. I felt that I was rather touchy				
19. I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat)				
20. I felt scared without any good reason				
21. I felt that life was meaningless				

Appendix B: Questionnaire (Chinese version)

内蒙古医科大学学生在 2021 年 COVID -19 疫情期间智能手机成瘾与心理健康之间的关系研究分析

问卷调查

保密性：该调查数据仅用于探索“内蒙古医科大学学生在 2021 年 COVID- 19 疫情期间智能手机成瘾与心理健康之间的关系”的研究分析。未经该人同意，不得泄露有关任何个人或其家庭的单项调查数据。

本研究介绍

本问卷旨在收集流行期间内蒙古医科大学学生对手机应用，人口统计学信息和心理健康状况的依赖性，特别是在抑郁，焦虑和压力三个方面，以探讨内蒙古医科大学学生智能手机成瘾与抑郁，焦虑和压力的心理健康关系，为学术研究提供了系统科学的数据来源，为相关决策部门提供了科学依据。

对于给您带来的不便，我们深表歉意。请理解并帮助我们进行工作。

未经您的许可，您提供的任何信息将被保密。而且此数据调查是匿名的。科学研究，政策分析和意见审查所发布的信息是大量调查表的摘要信息，而不是您的个人案例信息，并且不涉及您的个人和家庭信息的披露。

该调查是探索性的，已经得到内蒙古医科大学伦理委员会的批准。参加调查研究的人员将严格遵守保密原则。

非常感谢您的支持和帮助!

目录

过滤问卷

查找内蒙古医科大学学生，进行以下问卷调查。如果以下任何一个问题的回答为“否”，则不会进行其余的问卷调查。

Cov1.您现在是内蒙古医科大学的学生吗？

1.是的　　（继续此问卷）

2.没有　　（废弃此问卷）

Cov2.你有智能手机吗？

1.有　　（继续此问卷）

2.没有　　（废弃此问卷）

问卷 1：人口统计学和临床特征

请根据自己的实际情况填写。

1.你的年龄是 _____

2.您的性别是?

A.男

B.女

3.您的院系是 _____?

4.您的专业是 _____?

5.你的年级是 _____?

A.大一

B.大二

C.大三

D.大四

E.大五

6.您上学期的 GPA（学分绩点）是 _____？

7.您每月有多少生会费？

A.1000 元以下

B.1000-2000 元

C.2000 元以上

8.你从哪里来？

A.城市

B.农村

9.您通常会进行体育锻炼吗？

A.是（请回答第 10 题）

B.否（请忽略第 10 题）

10.如果是经常做体育锻炼，

10.1 主要进行什么类型的体育锻炼？_____

10.2 一周锻炼几次？_____

10.3 总共锻炼多长多长时间_____

11.你的身高是_____cm

12.你的体重是_____kg

13.你抽烟么？

A. 是的，我抽。（请回答第 14 题）

B. 不，我不抽，但我曾经抽。（请忽略第 14 题）

C. 不，我不抽。（请忽略第 14 题）

14.如果你抽烟，抽烟的频率是？

A.每天

B.一周 5-6 天

C.一周 3-4 天

D.一周 1-2 天

E.少于一周 1 次

15.在过去的 12 个月里，你喝过酒么？

A.有。（请回答第 16 题）

B.没有。（请忽略第 16 题）

16.喝酒的频率是？

A.一个月多于 5 次。

B.一个月 3-4 次。

C.一个月 1-2 次。

D.少于一个月 1 次。

问卷 2:智能手机使用行为

1. 你一周使用智能手机的频率?

A. 每天

B. 一周 5-6 天

C. 一周 3-4 天

D.一周 1-2 天

E.一周 1 天

F. 少于一周一次

2.在工作日，你一天使用多长时间手机?_____小时_____分钟

3.周末，你一天使用多长时间手机?_____小时_____分钟

4.你使用手机主要是干什么? （不能选择多于 3 个选项）

A. 网络社交（聊天等）

B. 看电影

C. 听音乐

D. 玩游戏

E. 搜索教育学习知识

F. 学习（网课等）

G. 看新闻报道

H. 其它，（请说明）_____

问卷 3.智能手机成瘾量表 Smartphone Addiction Scale (SAS-SV)

本问卷是一个关于智能手机使用的调查,请根据你的实际情况如实回答。在 1,2,3,4,5,6 个等级中选择一个与你情况最一致的等级后面画√。

1.由于使用智能手机而耽误计划好的工作
A.强烈不同意（1）
B.不同意（2）
C.稍微不同意（3）
D.稍微同意（4）
E.同意（5）
F.强烈同意（6）

2.由于使用智能手机,在执行任务或者工作学习时很难集中注意力
A.强烈不同意（1）
B.不同意（2）
C.稍微不同意（3）
D.稍微同意（4）
E.同意（5）
F.强烈同意（6）

3.使用智能手机时,手腕或颈后部感到疼痛
A.强烈不同意（1）
B.不同意（2）

C.稍微不同意（3）

D.稍微同意（4）

E.同意（5）

F.强烈同意（6）

4.无法忍受没有智能手机

A.强烈不同意（1）

B.不同意（2）

C.稍微不同意（3）

D.稍微同意（4）

E.同意（5）

F.强烈同意（6）

5.没带智能手机时感觉不耐烦或焦躁不安

A.强烈不同意（1）

B.不同意（2）

C.稍微不同意（3）

D.稍微同意（4）

E.同意（5）

F.强烈同意（6）

6.不使用智能手机时我也想着它

A.强烈不同意（1）

B.不同意（2）

C.稍微不同意（3）

D.稍微同意（4）

E.同意（5）

F.强烈同意（6）

7.即使我的日常生活受到很大程度影响，我仍不会放弃智能手机

A.强烈不同意（1）

B.不同意（2）

C.稍微不同意（3）

D.稍微同意（4）

E.同意（5）

F.强烈同意（6）

8.总查看手机以防错过在QQ、微信或者微博等社交网络上与他人的交流

A.强烈不同意（1）

B.不同意（2）

C.稍微不同意（3）

D.稍微同意（4）

E.同意（5）

F.强烈同意（6）

9.使用智能手机比计划的时间更长

A.强烈不同意（1）

B.不同意（2）

C.稍微不同意（3）

D.稍微同意（4）

E.同意（5）

F.强烈同意（6）

10.周围的人都说我使用智能手机的时间太长了

A.强烈不同意（1）

B.不同意（2）

C.稍微不同意（3）

D.稍微同意（4）

E.同意（5）

F.强烈同意（6）

问卷 4：COVID-19 流行期间的生活经历

1. 您是如何得知 COVID-19 大流行的？（你可以选择多选）

A、口耳相传

B. 电视（视听） 报纸（印刷版或网络版）

C. 社交媒体

D. 仅电视音频

2. 您是否感染过 COVID-19？

A. 是的

B. 否

3. 你认识的人里有人感染了 COVID-19 吗？

A. 是的

B. 否

4. 你有没有采取任何预防措施？

A.有。（请回答 5.1-5.4）

B.没有。（请跳至回答 6.1-6.2）

如果有，请回答 5.1-5.4

5.1 为了防止感染，避免离开家？

A. 是的

B. 不是

5.2 为了防止感染，佩戴口罩？

A. 是的

B. 不是

5.3 为了防止感染，勤洗手？

A. 是的

B. 不是

5.4 为了防止感染，与其它人保持距离？

A. 是的

B. 不是

如果没有采取防护措施，请回答 6.1-6.2 题

6.1 我觉得我感染不了 COVID-19

A. 是的

B. 不是

6.2 我缺少资源（比如口罩，酒精等）

A. 是的

B. 不是

7. 您是否觉得自己感染 COVID-19 的风险更大?

A. 是的

B. 否

8. 如果您感染 COVID-19，您是否觉得自己会面临更大的不良结果风险么？

A. 是的

B. 否

9. 如果您有潜在的健康状况，您是否觉得如果您感染了 COVID-19，您的病情会使您更容易出现并发症？

A. 是的

B. 否

10. 您有交通方面的顾虑吗？

A. 是的

B. 否

11. 您是否担心在社交场合与他人互动？

A. 是的

B. 否

12. 您是否担心不能获得医疗保健服务？

A. 是的

B. 否

13. 您是否担心获得食物和生活用品？

A. 是的

B. 否

14. 您是否担心不能维持学业？

A. 是的

B. 否

15. 您是否担心不能获得有关病毒的准确信息？

A. 是的

B. 否

16. 自 COVID-19 开始以来，您是否对自己的健康有更多的焦虑、恐惧和担忧么？

A. 是的

B. 否

17. 如果您出现 COVID-19 症状（咳嗽、喉咙痛、发烧），您会就医吗？

A. 是的

B. 否

问卷 5: 情绪自评量表/抑郁-焦虑-压力量表(DASS-21)

请仔细阅读以下每个条目，并根据**过去一周**的情况，在每个条目中选择适用于你情况的程度选项后面打 √。请回答每个条目，选择没有对错之分,不必在每个问题上花费太多时间。

1.我觉得很难让自己安静下来　　不符合　(0)
有时符合(1)
常常符合(2)
总是符合(3)

2.我感到口干舌燥　　不符合　(0)
有时符合(1)
常常符合(2)
总是符合(3)

3.我好像不能再有任何愉快、舒畅的感觉。　　不符合　(0)
有时符合(1)
常常符合(2)
总是符合(3)

4.我感到呼吸困难（例如：不是做运动时也感到气促或透不过气来）
不符合 (0)
有时符合(1)
常常符合(2)
总是符合(3)

5.我感到很难主动去开始工作
不符合 (0)
有时符合(1)
常常符合(2)
总是符合(3)

6.我对事情往往作出过度反应。
不符合 (0)
有时符合(1)
常常符合(2)
总是符合(3)

7.我感到颤抖（例如，手抖）
不符合 (0)
有时符合(1)
常常符合(2)
总是符合(3)

8.我觉得自己消耗了很多精力（精神）
不符合 (0)
有时符合(1)
常常符合(2)

总是符合(3)

9.我担心一些可能让自己恐慌或出丑的场合　不符合　(0)
有时符合(1)
常常符合(2)
总是符合(3)

10.我觉得自己对将来没有什么可期盼的。　不符合　(0)
有时符合(1)
常常符合(2)
总是符合(3)

11.我感到忐忑不安　不符合　(0)
有时符合(1)
常常符合(2)
总是符合(3)

12.我感到很难放松自己　不符合　(0)
有时符合(1)
常常符合(2)
总是符合(3)

13.我感到忧郁沮丧　不符合　(0)

有时符合(1)

常常符合(2)

总是符合(3)

14.我无法容忍任何阻碍我继续工作的事情 不符合 (0)

有时符合(1)

常常符合(2)

总是符合(3)

15.我感到快要恐慌了 不符合 (0)

有时符合(1)

常常符合(2)

总是符合(3)

16.我对任何事情都不能产生热情。 不符合 (0)

有时符合(1)

常常符合(2)

总是符合(3)

17. 我觉得自己不怎么配做人 不符合 (0)

有时符合(1)

常常符合(2)

总是符合(3)

18.我发觉自己很容易被触怒　　不符合　(0)

有时符合(1)

常常符合(2)

总是符合(3)

19.我察觉自己在没有明显体力劳动时，也感到心律不正常　　不符合　(0)

有时符合(1)

常常符合(2)

总是符合(3)

20. 我无缘无故地感到害怕　　不符合　(0)

有时符合(1)

常常符合(2)

总是符合(3)

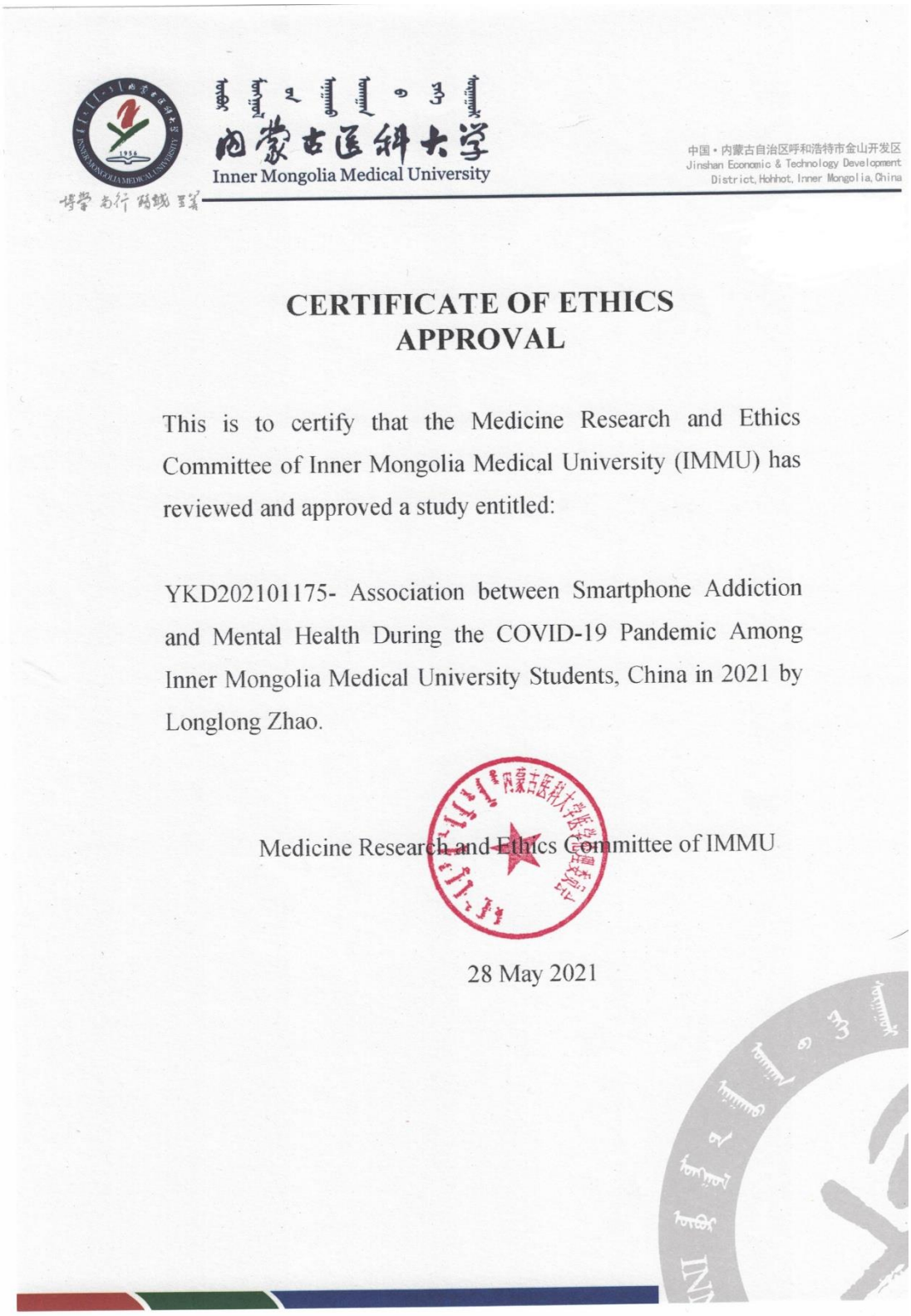
21. 我感到生命毫无意义　　不符合　(0)

有时符合(1)

常常符合(2)

总是符合(3)

Appendix C: Ethical consideration certificate



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Jinshan Economic & Technology Development District, Hohhot, Inner Mongolia, China

CERTIFICATE OF ETHICS APPROVAL

This is to certify that the Medicine Research and Ethics Committee of Inner Mongolia Medical University (IMMU) has reviewed and approved a study entitled:

YKD202101175- Association between Smartphone Addiction and Mental Health During the COVID-19 Pandemic Among Inner Mongolia Medical University Students, China in 2021 by Longlong Zhao.

Medicine Research and Ethics Committee of IMMU

28 May 2021

Appendix D: CV

NAME: Longlong Zhao

STUDENT NUMBER: 6374028853

FACULTY: Public Health

REREARCH ARER: Mental health of Public Health

EDUCATION:

Bachelor: Psychology, Inner Mongolia Medical University of China

Master: Public Health, Chulalongkorn University of Thailand.

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