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Mobile Phone Addiction of Nursing Students in Surgical Wards and Its Impact on Physical and Mental Health

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Abstract:
Objective: This study aimed to explore the impact of mobile addiction on the physical and mental health of surgical nursing interns in hospitals. Method: A questionnaire survey was conducted on 481 nursing interns in Gansu Province in September 2024 using the Mobile Phone Addiction Index (MPAI), Physical Health Questionnaire (PHQ), and Mental Health Questionnaire (GHQ-12) through convenience sampling. The pairwise correlation analysis between the mobile phone addiction Index (MPAI) score and health outcomes showed a significant correlation. There is a strong positive correlation between MPAI score and physical health ($r=0.548$, $p<0.001$), indicating that nursing interns have a stronger dependence on mobile phones and poorer physical health. In addition, there is a moderate positive correlation between MPAI scores and mental health status ($r=0.345$, $p<0.001$), indicating that an increase in mobile phone addiction can affect the mental health of nursing students. This research provides a theoretical basis for the adverse effects of mobile phone addiction on the health of nursing interns.

Keywords: Mobile phone addiction, physical health, mental health, student nurses, medical surgical nursing

1. INTRODUCTION

According to the report of China Internet Information Center (CNNIC), as of June 2024, the number of Internet users in China is close to 1.1 billion, an increase of 7.42 million over December 2023, and the Internet penetration rate is 78.0%. With more and more people using mobile phones, phone dependence has gradually become a phenomenon that cannot be underestimated. As the main mobile phone users, college students are already a susceptible group that relies on mobile phones. Research has shown that the mobile phone dependency rate among university and vocational school students is

23% (Xu et al., 2024), the detection rate of mobile phone dependency among medical students is 30.75%, and the smartphone dependency rate among nursing students is as high as 60.52% (Xiang et al., 2023). The degree of dependence on mobile phones is relatively high. 60.4% of mobile phone addicts suffer from depression (Li et al., 2024).

Surgical rotation is a compulsory item in the Chinese nurse qualification examination and also a compulsory department for intern rotation (Wang et al., 2019). Related to this, the literature review also found that clinical nursing interns heavily rely on mobile phones in their nursing work, and the degree of dependence varies among nursing departments (Tan et al., 2024). On the other hand, studies have shown that nursing students who have a moderate dependence on mobile phones have lower work efficiency due to entertainment functions, loose management, uneven workload, and the need for work communication on mobile phones can motivate them to use them (Wu et al., 2020).

With the gradual trend towards "elitism" in medical education, coupled with the relatively high difficulty level of learning in medical majors, medical students face significant pressure during long-term studies, which can easily lead to a tendency towards mobile phone addiction and sleep deprivation (Zhang et al., 2024). Nursing is a comprehensive discipline that integrates skill development and humanistic literacy cultivation. Nursing plays a crucial role in all aspects of hospital surgery. The difficulties that nursing students often face in clinical work are caused by various reasons such as busy work and excessive pressure. With the popularization of surgical procedures, surgical nursing procedures are very common in surgical wards (Yu et al., 2015). Nursing students usually use smartphones to browse and spread information and experience the convenience and fun brought by the Internet, greatly enriching nursing students' learning resources and methods, but excessive dependence may also bring adverse effects (Wang et al., 2024).

However, many "mobile phone controls" blindly indulge in the Internet or games. Without a mobile phone, it is easy to cause anxiety, impatience, and inability to concentrate, which can seriously interfere with their normal learning and life, and their mental health level is also worrying. The dependence on mobile phones among nursing students not only affects personal health, but also seriously affects the nurse patient relationship and reduces the quality of nursing services (Li , 2024). The temptation of mobile phones may lead to low learning efficiency and addiction to mobile phones. This is a state of obsession, where uncontrolled excessive use of mobile phones seriously affects physical and mental health (Wang et al., 2014). Research has found that smartphone dependence can lead to many physical and mental harms, such as depression, anxiety, sleep disorders, interpersonal relationship problems, eye fatigue, neck problems, etc., seriously affecting users' normal lives (KIME et al., 2022& Zhang et al., 2022). The more severe the phenomenon of mobile phone addiction, the greater the interference on the attention, self-control, and learning plans of nursing students, ultimately leading to a decline in grades (Ni et al., 2018). This is consistent with Tang research findings. The problem of mobile phone addiction among medical students in universities is becoming increasingly serious, seriously affecting their physical and mental health and daily life. There is a correlation between the physical condition of college freshmen and symptoms of depression, mobile phone addiction, and their comorbidities (Yang et al., 2024). The phenomenon of mobile phone addiction among medical students

is influenced by various factors, which may include emotional reasons such as high scores, negativity, anxiety, and depression (Zhang et al., 2024).

As a tool itself, there is no right or wrong with mobile phones, the key lies in how people use them. Nursing students are able to use mobile phones reasonably, which is very beneficial for their growth and development. We should guide students to reduce internal friction, improve self-control ability, and advocate a healthy lifestyle from multiple aspects (Wang et al., 2024). In the past, in the era without mobile phones and mobile Internet, students lacking correct learning concepts and moral values would also avoid learning through other ways. In the process of education, teachers' outdated management concepts often only focus on surface phenomena and fail to fully pay attention to students' psychological activities. They are unable to intervene in students' psychological states in a timely and effective manner and reshape their ideological concepts, which is a major reason why students become addicted to mobile phones and cannot extricate themselves. Therefore, considering the above and existing literature gaps, this study aims to explore the impact of mobile addiction on the physical and mental health of internal medicine and surgical nursing interns.

2. STUDY OBJECTIVES

2.1. General Objective

This study aimed to determine the impact of mobile dependence on the physical and mental health of the students nurses exposed in medical surgical units.

2.2. Specific Objectives

This study also aimed to:

1. describe the sociodemographic characteristics of the respondents as to:

a. Sex;
b. Age;
c. Ethnicity;
d. Religion;
e. Residential Category;
f. Number of Siblings;
g. Family Monthly Income;
h. General Weighted Average (last semester); and
i. Level of Hospital Affiliation for the Medical and Surgical Units.

2. To determine the respondents, level of mobile phone addiction;
3. To identify the self-assessed physical health measurement of the respondents;
4. To describe the self-assessed mental health status of the respondents;
5. To determine the difference of mobile phone addiction, self-assessed physical, and mental health of the respondents when grouped according to demographic profile; and
6. To determine the relationship and effects of mobile phone addiction to the self-assessed physical and mental health of the respondents.

Hypothesis:

Ho1: There is no significant difference between the mobile dependence, self-assessed physical and mental health of respondents when grouped according to the respondent's profile; and

Ho2: There is no significant relationship between self-assessed mobile dependence to the self-assessed physical and mental health of the respondents.

3. RELATED LITERATURE RESEARCH

3.1. Social and Demographic Overview of Chinese Health Care

By the end of 2023, the total number of registered nurses in China will reach 5.63 million, with 4 registered nurses per 1000 population. According to the Central People's Government of the People's Republic of China, over 80% of nurses have a college degree or above (Guangming Daily, 2024). These data indirectly reflect that the workload, stress level, and educational background of nursing students may be related to their dependence on mobile phones. Nursing interns are an indispensable part of nursing education and teaching. They combine theory with practice, apply professional knowledge and skills to clinical practice, and fully possess the basic abilities for relevant positions in various medical institutions after graduation (Zou et al., 2020). In recent years, the training and development of nursing interns in China have been rapid. Only by analyzing and studying the impact of various factors can we master more comprehensive, feasible, and systematic methods, thereby better promoting the further development of the nursing industry (Chen, 2000; Yan et al., 2004; Wang et al., 2007).

3.2. The current situation of nursing internships in hospital surgery

Surgical nursing is a highly specialized nursing department, and its theoretical knowledge and practical skills are important components for nursing interns to complete clinical internship courses. Surgical internships are included as a compulsory content in the internship outline of nursing interns at all levels of education (vocational school, vocational college, undergraduate, etc.) (Lin et al., 2022). At present, teaching in China mostly adopts three modes: "one-to-one", "one-to-many", and "sub specialty grouping" (Wu et al., 2021; Liu et al., 2020). The objects of my research cover all prefectures and cities in Gansu Province, with a wide range of students. The hospital I am studying at adopts a "one-on-one" teaching model, and has always been using full process teaching. Due to feedback from the supervising teacher, the interns frequently check their phones during work breaks. The attention to mobile phones exceeds the interaction with patients. When it comes to work that requires concentration, still be distracted while checking your phone. Nurses themselves may realize and report that their use of mobile phones has affected other aspects of work and life. On the other hand, patients have reported that nursing students often use mobile phones and have raised opinions or complaints about it. There are no explicit regulations or punishments for nursing students using mobile phones, and most of them only provide verbal prompts. Through investigation and research on nursing students, the common problem of mobile phone addiction can be revealed.

The learning difficulty of medical majors is high, with a lot of content, requiring a lot of time and energy to learn, as well as mastering various clinical knowledge and skills, and being able to handle complex clinical cases. Therefore, medical students often rely on smartphones to relieve stress, ultimately leading to smartphone addiction, affecting their academic performance, and may even

neglect their studies. (Zhang et al., 2024).Medical students' mobile phone addiction and addiction tendencies have intensified, and excessive use of mobile phones poses serious harm. Research shows that the mobile phone addiction rate of medical students reaches 47.5%, and nearly half of the students have mobile phone addiction, which is consistent with previous studies showing a high tendency of mobile phone addiction among medical students (He, 2023). This may lead to increased procrastination behavior, low learning or work efficiency, and in severe cases, significant difficulties in daily life. The research results of this article show that the mobile phone addiction rate among medical students is 64.7%, which is consistent with the research findings of Hale et al. on mobile phone addiction among medical students(Jafari, H et al., 2019) . It can be seen that the addiction rate of mobile phones among contemporary medical students is relatively high. Research has shown that addiction to mobile phones can lead to problems such as anxiety, depression, palpitations, and decreased immune function in the body. In addition, studies have shown a correlation between smartphone addiction tendency and loneliness, and smartphone addiction tendency can to some extent predict an individual's level of loneliness (Deng, 2023). The serious problem of mobile phone addiction among medical students poses a significant threat to their physical and mental health. Both families and schools need to take timely measures to promote the healthy development of students.

3.3. The current situation of nursing internships in hospital surgery

3.3.1. The dependence on mobile phones in nursing is at a moderate level (Wu et al., 2020). Li Na pointed out that 100% of college students like to use their phones to surf the internet, and 65.7% of college students use their phones more frequently, even reaching an addictive state (Li et al., 2013). Research has shown that college students are more dependent on mobile phones, which is consistent with previous research findings (Lian et al., 2018). Wang's(Wang, et al., 2020)research found that Chinese female nursing students rely more heavily on mobile phones.Student dependence on mobile phones refers to the addictive behavior of individuals who excessively rely on mobile phone usage, are unable to control their own usage behavior, and have negative effects on psychological, behavioral, and social functions (Billieux, 2012; Liu et al., 2017). This indicates that the trend of dependence on mobile phones among nursing students is becoming increasingly prominent, and the dependence situation is becoming increasingly severe. The behavior habits of nursing students using mobile phones are a social concern (Ge, et al., 2016).

3.3.2. Possible reasons for relying on mobile phones in nursing care

Realistic application requirements. In reality, mobile phones have penetrated into various aspects of people's daily lives, such as clothing, food, housing, and transportation. For example, buying clothes in online stores is cheap and convenient; You can order takeout on your phone; Book hotel accommodations for travel, with reasonable prices and hassle free options; Train tickets, airplane tickets, etc. can also be purchased without queuing up at train stations or airports. This kind of smartphone intelligence not only brings more choices and convenience to the public, but also makes them unconsciously imprisoned. The entertainment functions of mobile phones, such as mobile games, music, movies, social media, etc., make college students immerse themselves and unable to extricate themselves.

Research has shown that mobile phone addiction causes many healthcare workers, such as nurses, to waste their work time and energy on socializing and entertainment, leading to low work efficiency (Wu et al., 2020). The pressure and difficulties in life may stimulate motivation to go online, as negative emotions can drive nursing students to shift their attention to their phones, resulting in a dependence on them. This dependence is triggered by inner motivation, which temporarily forgets negative emotions by paying attention to information on the phone, thereby alleviating discomfort. There may be several reasons for this: firstly, certain functional services provided by smartphones (such as videos, games, etc.) are extremely tempting, making it difficult for some less restrained caregivers to resist the temptation; Secondly, the implementation of management systems is not strict, and there are no clear regulations on the time and occasions for using mobile phones; Thirdly, the uneven workload of nursing work within a unit workday can easily lead nursing students to use mobile phones due to boredom during relatively idle time periods; Fourthly, mobile phones have become an important means of work communication in many organizations (such as WeChat work groups), Important messages posted by teachers (mentors) in QQ or WeChat groups have to be checked in a timely manner. Over time, using a mobile phone is no longer a personal choice, but is forced by work and learning, and kidnapped by technology.which also requires nursing staff to frequently use mobile phones. It is recommended that nursing managers strictly implement the punishment system for improper use of mobile phones and optimize work arrangements to reduce the dependence of nursing students on smartphones.The use of mobile phones provides individuals with the opportunity to avoid facing real-life social challenges through the virtual world, and can alleviate their anxiety in this way.

3.4. The impact of dependence on mobile phones in nursing on physical health

The study by Xiang et al. (2023) found that improper use of mobile phones by individuals can cause significant damage to their psychological, physiological, and social functions. Common discomfort symptoms include but are not limited to anxiety, depression, arthritis, insomnia, etc. Mobile phone addiction can lead to neck, shoulder, and back pain, as well as hearing and vision loss (Jenaro et al., 2007). Long term use of mobile phones may have a negative impact on the physical health of caregivers. Previous studies have shown that prolonged use of mobile phones not only directly causes physical symptoms to the human body, but also weakens interpersonal relationships and triggers negative emotions such as anxiety (Zhang et al., 2019). Long term looking down at your phone may lead to neck and eye problems, and even discomfort symptoms such as headaches and dizziness. In addition, excessive use of mobile phones may also lead to caregivers lacking exercise and outdoor activities, increasing the risk of obesity and cardiovascular disease. The blue light emitted by mobile phone screens can interfere with the synthesis of melatonin in the human body, leading to frequent mild sleep and decreased sleep quality (Lv et al., 2008). This series of numbers indicates that excessive use leads to decreased grades, depression, and anxiety, but excessive reliance on smartphones may have an impact on professional skill development and physical and mental health, pose a risk of adverse events, and pose a serious threat to patient safety (Ma , 2021).

3.5. The impact of mobile phone addiction on mental health in nursing students

Yuan (2017) pointed out that emotions are an important variable affecting medical students' dependence on mobile phones. Dan et al. (2023) pointed out that mobile phone addiction among college

students is positively correlated with stress levels. Mobile phone addiction is significantly positively correlated with depression, loneliness, social anxiety, time waste, avoidance behavior, and hyperactivity (Cheung, 2011). Anxious individuals lack sufficient confidence to effectively manage their emotions when facing real-life pressures and challenges, and tend to choose to use mobile phones to escape reality, thereby reducing their sense of anxiety. Recent studies have revealed that withdrawal symptoms have become a characteristic of mobile phone addiction behavior. Studies have found that research subjects experience severe mood changes when they are unable to use their phones due to lack of internet connection or the need to turn them off (Bianchi, 2005 & Kim et al., 2014). King et al. (2010) found that the inability to use mobile phones increases individual anxiety and unease, and mobile phones can serve as devices to enhance security. Using mobile phones can ensure social interaction, but it also reduces direct contact. Mobile phone addiction still has more disadvantages than advantages (Chai, 2017). Domestic research also shows that there is a negative correlation between self-control and internet dependence among Chinese college students (Zhang, 2020). Mobile phone addiction may lead to psychological problems such as anxiety and depression in nursing students. Early research mainly focused on summarizing the phenomenon of mobile phone use among young students. These reviews took a multidisciplinary perspective from the phenomenon of mobile phone use (Yan, 2009; Wang, 2013) and explored the current situation of mobile phone addiction (Long, 2015; Wang, 2014; Qu, 2016) and its causes (Jing, 2015; Guo, 2013; Shang, 2016; Lv, 2015). They analyzed the characteristics of mobile phones, individual characteristics of students, and family environment (Lv, 2015; Shao, 2016; Shao, 2012; Pan, 2013; Wang, 2013; Meng, 2015) in the doctoral thesis of Jilin University, and explored the impact of mobile phone addiction on students' behavior. The harm of behavior to students' physical and mental health (Liu, 2013) and academic life (Sun, 2015; Li, 2016) (Qu, 2014; Qiu, 2014), And propose targeted coping strategies and urgent research problems (Chen, 2015;He, 2016;Ma et al., 2015; Sun et al., 2014;Wang et al., 2016; Yao, 2015). Jia (2015) conducted a partial review of research on mobile phone addiction abroad, defining mobile phone addiction and exploring the influencing factors of mobile phone addiction behavior. Wang et al. (2016) analyzed the progress of psychological research on mobile phone addiction in China and proposed the need for more psychological counseling to help students alleviate mobile phone addiction. In addition, the application of psychological theory to analyze mobile phone addiction behavior has begun to emerge.

This vicious cycle is becoming increasingly severe, as individuals are influenced by external pressure and their negative emotions become stronger, leading to longer and more intense use of mobile phones. Mobile phone addiction not only has negative physiological effects on individuals, but also has negative physiological effects and a series of negative psychological impacts. Intervention measures for medical students can start with improving positive emotional experiences and reducing sensitivity to negative emotions (Yuan et al., 2017). Surgical nursing students in hospitals face enormous work pressure, and long-term dependence on mobile phones may make them more isolated and unwilling to communicate with others, thereby affecting their mental health.

3.6. The Use of Mobile Phones in Health Care

Given the universality and importance of mobile phone usage, firstly, it can help nursing students better manage patient information, such as verifying patient information, medication status, condition,

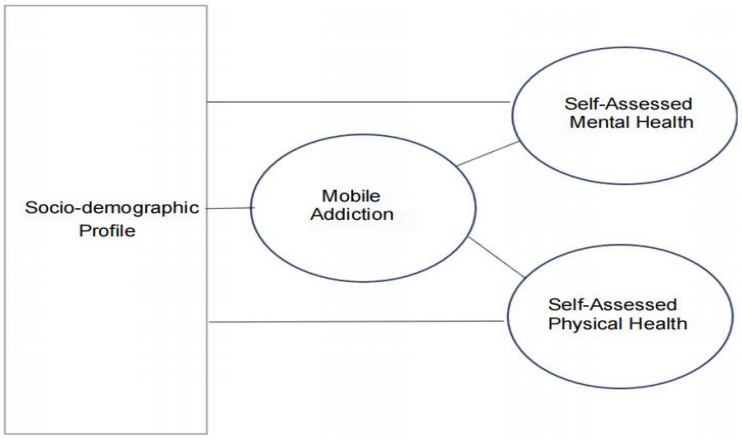
examination results, etc., greatly saving time. Secondly, it can help nursing students communicate better, such as communicating with other nurses, doctors, patient families, etc. through mobile phones, in order to better coordinate nursing work. In addition, it can also better keep nursing records for tracking the nursing process. Nursing students may use mobile phones to search for medical information, exchange learning experiences, and use various medical applications. Using mobile phones can better manage nursing work and improve nursing quality. In short, the convenience brought by mobile phones is also ubiquitous in our lives. It greatly promotes the intelligence, digitization, and convenience of life, and can meet people's needs for communication, content search, news, shopping, payment, music, games, literary appreciation, takeout, and online education courses. On this aspect, hospital management departments can provide training and resources to help nursing students manage their mobile phone usage, such as being able to focus on learning and work during internships, while protecting patient privacy and safety. Nursing students should comply with these regulations to ensure that they can focus on their work and provide high-quality nursing services.

3.7. FUTURE RESEARCH PROSPECTS

The innovation of this study lies in exploring the impact of mobile phone addiction as an independent factor on the physical and mental health of surgical nursing students in hospitals. It combines improving the learning efficiency of nursing interns with enhancing their professional abilities, and proposes corresponding intervention measures, such as optimizing the internship environment, designating mobile phone free areas or educational programs for nursing students and nurses. This study provides information for intervention measures. Future research should explore how different types of mobile phone use (such as social media, gaming, information search) affect health to varying degrees, and consider how cultural, age, and gender factors regulate these relationships.

In summary, the significant correlation between MPAI scores and health outcomes reveals the negative impact of mobile phone addiction on individual health. These findings are important for public health policy makers, healthcare providers, and educators who can design and implement targeted interventions based on this data to reduce the adverse effects of mobile phone addiction on health.

4. CONCEPTUAL FRAMEWORK



This study focuses on the profile of medical-surgical interns, their mobile addiction index, and their physical and mental health. Particularly, this will explore further the difference of mobile phone

addiction, physical health, and mental health when analyzed considering their profile. Further, this study shall also identify the relationship and effect between the constructs of the mobile dependency, and the self-assessed physical and mental health.

5. METHOD

5.1. Research Design and Locale

This study conducted a survey on nursing students who are currently undergoing surgical internships in schools across Gansu Province. This study adopted a quantitative cross-sectional research design to describe and compare the variable relationships between these individuals. Random sampling method (lottery method) was used to target respondents who had undergone surgical rotation internships at Gansu Provincial People's Hospital. The sample included nursing interns from Gansu Health Vocational College, Lanzhou Vocational and Technical College, and Lanzhou Modern Technology College. The sample size of the survey is 481, and the respondents were recruited during the second to fourth weeks of medical and surgical work to ensure that they adapted to the medical surgical environment. The collection time is September 17th to September 30th, 2024. This included the situation of nursing interns from Gansu Health Vocational College, Lanzhou Vocational and Technical College, and Lanzhou Modern Technology College during their surgical internships, covering nursing and traditional Chinese medicine nursing majors. This study aimed to explore the phenomenon of mobile phone addiction among nursing students and its complex relationship with their physical and mental health through a carefully designed questionnaire.

This study is divided into two core stages: the first stage focused on collecting a wide range of social and demographic characteristics of nursing students, including age, race, religious background, living environment, family structure, and economic status. These data provided a solid foundation for analysis, ensuring sample diversity and representativeness, and laying the groundwork for subsequent analysis to control the influence of variables and improve the accuracy of results. At the same time, professional scales such as the Mobile Phone Dependence Index (MPAI), Physical Health Questionnaire (PHQ), and Mental Health Questionnaire (GHQ-12) were used to comprehensively evaluate the degree of mobile phone dependence, physical health status, and mental health level.

In the process of research design and data analysis, the following strategies were adopted to prevent method bias: a) clear research objectives were set. Based on clear literature gaps, research questions and hypotheses have been clearly defined, avoiding any form of bias caused by ambiguity; b) adhere to appropriate research procedures and statistical analysis. Inclusion and exclusion criteria have also been established to ensure homogeneity among respondents. This study utilized previously validated and reliable tools, accompanied by scoring guidelines to ensure clear guidance on data collection and clarification methods. In terms of analysis, normality tests and related inferential statistics were also conducted to assist in the statistical integrity of the study.

5.2. Study Participants

5.2.1. Sample size and sampling

This study used a simple random sampling method, namely the lottery method, especially for respondents who underwent surgical rotation internships at Gansu Provincial People's Hospital. The

selection of this sampling design is to reduce sampling bias and ensure that the sample has broad representativeness. The list of qualified students is randomly selected during the actual hospital internship period, as the number and list of local internship students can be obtained from the hospital. Especially, considering the inclusion and exclusion criteria set, the interviewees were recruited during their work in the medical and surgical departments, which took place from week 2 to week 4 to ensure they had adapted to the medical surgical environment. The sample includes respondents from three three-year nursing vocational colleges in Gansu Province (Gansu Health Vocational College, 251 students in four classes; Lanzhou Vocational and Technical College, 141 students in three classes; Gansu Modern Technology College, 89 students in two classes).The survey sample size was 481, and the final effective sample size of vocational college students was 481, with a recovery rate of 100%.

5.2.2. Inclusion and Exclusion Criteria

Based on the identified characteristics of the respondents and the related constructs and post consultation of technical experts (statistician who did initial sensitivity analysis, mental health expert, and medical surgical nurse supervisor), the following inclusion and exclusion criteria were set:

Inclusion criteria:

1. 18 years old and above;Reason: Being over 18 years old means that the respondents have legal status as legal adults and are able to make autonomous decisions about participating in the research, ensuring that they fully understand the content of the research and give informed consent. This is in line with the ethical principle of respecting people, ensuring that participants can voluntarily participate in research and are aware of their rights and choices.
2. Currently enrolled in one of the three participating colleges;Reason: Students from these three colleges were chosen to ensure that the research sample has a clear scope and comparability. This can help researchers focus on similar educational environments and internship experiences to obtain more representative data. At the same time, this standard ensures the justice of research by studying specific groups in specific contexts, rather than collecting irrelevant samples widely.
3. During the data collection period, all respondents worked as nursing interns in surgical and medical institutions; Reason: This standard ensures that respondents have relevant internship experience and can provide valuable data for research. The research topic may be related to the internship process, so only students interning in surgical and medical institutions can provide answers that meet the research needs. This standard helps to ensure the principle of benevolence in research, that is, the relevance and validity of research data will not be affected by irrelevant data, thereby improving the quality and application value of research results.
4. Personnel who agree to participate in the study.

Exclusion criteria:

1. Participants who were not present during data collection; Since this research relies on timely and accurate data collection, and students who are unable to participate in data collection cannot provide reliable information. Therefore, excluding participants who were not present can ensure the integrity and quality of the data. This standard conforms to the principle of benevolence, ensuring the accuracy and validity of research data while avoiding incomplete data from affecting the fairness of research results.

2. Students who do not have the ability or conditions to use mobile phones; Reason: Due to the use of mobile questionnaires in the study, if students do not have the ability or conditions to use mobile phones, they cannot participate in data collection. Therefore, excluding these students is to ensure the operability of research tools and the integrity of data. This is in line with the principle of fairness, which only includes students who can fully participate in the research and does not force students who cannot participate to make inappropriate attempts.
3. Measures to reduce bias:

To ensure consistent and fair application of inclusion and exclusion criteria, researchers have taken the following measures:

Unified evaluation process: Conduct the same screening procedure for all potential participants to ensure that the application of standards is not influenced by subjective judgments or biases.

Transparent screening criteria: Clearly explain the specific definitions and application conditions of each exclusion criterion.

Controlled informed consent process: Participants have fully understood the research content, privacy protection, and the rights to participate and withdraw during the informed consent process, avoiding unfair screening due to misunderstandings or pressure.

5.3. Research Instruments

5.3.1. The researchers have independently designed a general information survey, which will include demographic data and a survey on smartphone usage. The social statistical data to be collected will include: gender, age, race, nationality, education level, whether the participants are only children, voluntary choice of nursing profession, attitude towards nursing profession, academic level, and family background.

5.3.2. The Mobile Phone Addiction Index Scale (MPAI) was used to assess the level of mobile phone addiction(Li linhua&Chen Lilan 2024). This scale consists of 17 items, including dimensions of loss of control, withdrawal, avoidance, and inefficiency. It is rated on a scale of 1-5, with a total score of the sum of each item's scores. The total score ranges from 17 to 85, with each item rated from 1 (never) to 5 (always). A total score of ≥ 50 indicates the presence of mobile phone addiction, 50-59 indicates mild addiction, 60-69 indicates moderate addiction, and ≥70 indicates severe addiction(Hou Chunting et al.,2024). The higher the overall score, the higher the degree of dependence on mobile phones. In this study, Cronbach's alpha coefficient of the scale was 0.864(Li linhua&Chen Lilan 2024).

5.3.3. The Physical Health Questionnaire (PHQ) is a questionnaire used to assess physical health and a brief self-report scale of physical symptoms. It displays four different physical symptoms: gastrointestinal problems Projects 1-4, headaches Projects 5-7, sleep disorders Projects 8-11, and respiratory infections Projects 12-14 Among them, item 4 is reverse scoring.The main statistical indicator of this scale is the total score. People with SDS scores below 50 are considered non depressed, those with scores between 50-59 are classified as mild depression, those with scores between 60-69 are classified as moderate depression, and those with scores above 70 are classified as severe depression. The internal consistency reliability of four PHQ subscales has been evaluated using the alpha formula of Klenbach's (1951) coefficient (implemented using SPSS). These analyses indicate that these values are applicable to gastrointestinal problems (0.83), headaches (0.88), sleep disorders (0.80), and respiratory infections

(0.66), respectively. The alpha coefficient of the Cronbach's scale will be ≥ 0.80 (Schat Aaron CH et al., 2005).

Scoring criteria for physical health

project / figure	Scoring elements (points)					score
	0–4	5–9	10–14	15–19	20–27	
Gastrointestinal problems	Asymptomatic	The tissue structure of the stomach is normal and there is no obvious inflammatory response	Mild inflammatory response with symptoms such as mild stomach pain, bloating, and acid reflux	The reaction is more intense, and there may be persistent stomach pain, bloating, and indigestion	The main symptoms include persistent nausea, vomiting, stomach pain, bloating, acid reflux, and gastrointestinal bleeding	
Headache problems	Asymptomatic	Suffering from dizziness and no vomiting	Dizziness, vomiting, mild pain, tension headache	Dizziness, vomiting, moderate headache, increased frequency of headache accompanied by physical symptoms	Severe headache, unbearable	
sleep disturbance	Asymptomatic	Sleep is very peaceful	Snoring can cause nightmares and disturb others	Difficulty falling asleep, easy to wake up in the middle of the night, night sweats	Unable to fall asleep, relying on medication to fall asleep	
respiratory tract infection	Asymptomatic	Mild symptoms such as coughing, sneezing, nasal congestion and runny nose	Fever, cough, sore throat, shortness of breath, and sputum production	Coughing with a large amount of phlegm, coughing, and swelling in the throat	Throat swelling and pain, hoarse voice, and overall weakness	

5.3.4. The Mental Health Questionnaire (GHQ-12) is one of the commonly used scales in mental health work, widely used to assess mental health status. Its reliability and effectiveness will be tested in occupational populations. The internal consistency reliability coefficient of GHQ-12 is 0.71.This questionnaire consists of 12 items and is scored on a 4-point scale, ranging from 1 point for "never" to 4 points for "frequently". The score range will be between 12 and 48 points. The higher the score, the lower the level of mental health. A total score exceeding 27 indicates poor psychological condition. Among them, 6 items are positive, and those who answer "rarely" or "never" are abnormal; Six projects will be negative, and those that answer "often" or "sometimes" will be considered abnormal(Li Yongxin et al.,2008).

5.4. Translation Procedures

The entire text was translated using the PC version of Baidu Translate V1.7.0. Text translation: Supports translation between over 200 languages, as well as vertical translation in fields such as biomedical, electronic technology, and hydraulic machinery. It provides authoritative dictionaries such as Oxford and Collins, a large number of bilingual example sentences, featured video explanations, root and affix analysis, synonym analysis, and other dictionary resources. The above translation is also back translated and certified by two language experts. The respondents completed the questionnaire in less than 10 minutes.

5.5. Specific procedures based on research objectives

5.5.1. Program 1: Communication Information

The researchers have obtained approval from the student counselor to allow class members to participate in this study. I have explained to the department head and submitted a formal letter. Personal consent has become part of the electronic survey questionnaire.

5.5.2. Procedure 2: Questionnaire Survey

The survey method has been approved by the school management personnel. The survey of the research subjects has been completed using QR codes generated by Questionnaire Star. All students are able to fill out the questionnaire on their own and have now completed it.

5.5.3. Procedure 3: Response follow-up

If participants have any questions or concerns about their rights, they can contact the researchers using the email provided below:

Researcher Zhao Qiuyan

zhaoqiuyan@auf.edu.ph

5.6. Ethical Considerations

Approved by the Ethics Review Committee of the University of Los Angeles Foundation on September 17, 2024.

5.6.1. Informed consent procedures, participation time, and exit criteria

5.6.1.1. Ensure that participants understand the purpose and specific content of the study.

The research process maintains independence, and student supervisors, internship supervisors, and peers did not participate in or interfere with the informed consent process. The researchers have provided an electronic consent form that clearly states the relevant information to ensure that participants read it carefully and have signed to confirm their consent.

5.6.1.2. The participant has completed the questionnaire by scanning the code.

The filling time is less than 10 minutes.

5.6.1.3. Participants have the right to freely choose whether or not to participate in the study, and may withdraw at any time, whether at the beginning, middle, or after completing the questionnaire.

Withdrawing from the study will not have any negative impact on their academic performance, internship evaluation, or relationship with researchers. Researchers respect participants' withdrawal decisions, do not require them to provide reasons, and there will be no punishment or negative consequences. Due to online participation in the survey, participants can close their browser window or click the 'Exit' button to terminate their participation at any time. The research data is processed anonymously, and personal identification information will not be associated with the questionnaire results, ensuring that the privacy of participants is fully protected.

5.6.2. Risks and Inconvenience

Considering the minimal risk that this study may bring to the research participants, the following are recognized with corresponding risk mitigation and contingency measures:

Psychological and emotional risks:Certain questions in the questionnaire, particularly those related to personal behavior (such as mobile phone usage habits) or time management, may cause discomfort or stress to some participants, especially when they feel anxious or self critical about their habits. Researchers have reminded participants that they can choose to skip any questions they do not want to answer or withdraw from the study at any time without any adverse consequences. Meanwhile, the research team has provided appropriate support. If participants feel troubled while filling out the questionnaire, they can contact the research team for help and guidance.

5.6.3. Technical Risks: The questionnaire was filled out online, and participants did not encounter any technical issues, and the questionnaire was completed smoothly.

5.6.4. Privacy and Data Security: The questionnaire is conducted and completed in a completely anonymous manner, and participants do not need to provide personal identification information (such as name, student ID, etc.). Any personal characteristic information collected in the questionnaire (such as age, gender, etc.) is de-identified and unrelated to specific individuals to ensure that the data cannot be traced back to individual participants. The data has been collected through the Wenjuanxing platform and stored in a protected database. The research team has used encryption technology to store data without unauthorized access or leakage. Only authorized researchers can access the data, and the data processing process strictly follows permission management measures to ensure the security of the data. According to relevant regulations and ethical requirements, research data is stored for a period of time after completion of the study, and then securely deleted or archived. Participants have a clear understanding of the data retention period and deletion methods.

5.6.5. Inconvenience during the withdrawal process: Inconvenience during the withdrawal process: Participants have the right to withdraw from the study at any time, and the researchers have clearly stated that withdrawing from the study will not have any negative impact on the participants' academic, internship, or researcher relationships. The exit process has been designed to be simple and stress free, and participants can terminate their participation by simply closing their browser or clicking the 'exit' button. In addition, participants did not receive any monetary compensation during the study period. For participants who have already completed the study, the risk can be ignored.

5.6.6. Benefits of this study

①**Improving the learning efficiency of nursing students:** By studying the impact of mobile phone addiction on surgical nursing interns in hospitals, nursing interns can recognize the dangers of mobile phone addiction and focus more on learning and practice to improve learning outcomes.

②**Optimizing internship environment:** Understanding the impact of mobile phone addiction on the internship environment can lead to targeted improvements and create a more favorable learning and growth environment for nursing students.

③**Provide scientific basis for hospitals and medical schools:** Develop education plans for nursing students

④**Enriching research achievements in related fields:** It can enrich research achievements in related fields and provide reference and inspiration for research in other fields.

⑤ **Strengthening social attention to the nursing industry:** can increase social attention to the nursing industry, encourage relevant departments to increase support and investment in the nursing industry, and

promote the development of the nursing industry.

5.7. Privacy, Data Management, and Withdrawal Criteria

No identity information was disclosed in the study. Participants are aware that their personal information will be kept completely confidential, and the data will only be used for research purposes and will not be used for any commercial or non research purposes. At the same time, participants also know how their data is processed and request to view, modify, or delete the data they provide within a reasonable range. The hard copy data is stored in a locked cabinet, while the soft copy comes from a

password encrypted drive link. Hard copies will be shredded, while soft copies will be permanently deleted within three years after manuscript approval.

6. STATISTICAL ANALYSIS OF DATA

The categorical variables have been presented in frequency and percentage with graphical representations in tables and charts. Quantitative variables are reported in the form of mean ± standard deviation (for normally distributed data) or median interquartile range (for non normally distributed data). The Shapiro Wilk test was used to determine the normality of data.

To explore the relationship between mobile device addiction and the investigated variables, Pearson correlation analysis has been conducted. Spearman rank correlation analysis for non normally distributed data or variables on an ordered scale.

To evaluate the impact of mobile dependency on physical and mental health scores, regression analysis has been employed. The assumptions of the regression model include independence, normality, linearity, and variance constancy, and the applicability of the model has been rigorously examined. To prevent bias in common methods, Harman's one-way test has been used to evaluate the effectiveness of the scale and determine if there are scales measuring the same thing.

All statistical tests have been conducted using R studio software version 4.2.1 at a significance level of 5%.

7. RESULTS

7.1. The demographic characteristics of the 481 respondents reveal a predominantly female sample, with 90.23% identifying as female and 9.77% as male. The majority of respondents are aged 18-20 (54.05%), followed by those aged 21-23 (40.54%), with a small proportion (5.41%) in the 24-26 age group. Ethnically, the sample is primarily Han Chinese (85.03%), with minor representation from various ethnic groups such as the Hui (7.28%) and Tibetan (4.57%). A significant majority (91.89%) identify with no religion. Most respondents live in the countryside (64.45%), and the largest group of siblings reported is two (37.42%). Family income is concentrated in the lower brackets, with 42.62% earning below 3,000 and 43.66% between 3,001 and 6,000 monthly. Academic performance is notably strong, with 63.41% achieving scores between 80-89, and only a small fraction (0.42%) scoring below 60. Finally, the respondents are primarily affiliated with level 3 hospitals (60.71%),as shown in Table 1:

Table 1. Demographic characteristics of the respondents.

Characteristic	Categories	Frequency	Percentage
Sex	Male	47	9.77%
	Female	434	90.23%
Age group	18-20	260	54.05%
	21-23	195	40.54%
	24-26	26	5.41%
Nationality	Han Chinese	409	85.03%

	Manchu	1	0.21%
	Mongolian	1	0.21%
	Hui ethnic group	35	7.28%
	The Zang or Tibetan people	22	4.57%
	Uygur ethnic group	2	0.42%
	Yi ethnic group	1	0.21%
	Tujia ethnic group	1	0.21%
	Dongxiang ethnic group	8	1.66%
	Tu ethnic group	1	0.21%
Religion	Nothing	442	91.89%
	Yes	39	8.11%
Living category	Countryside	310	64.45%
	Country	11	2.29%
	County	86	17.88%
	Suburb	1	0.21%
	City	73	15.18%
Number of siblings	1	165	34.30%
	2	180	37.42%
	3	85	17.67%
	4	39	8.11%
	5 or more	12	2.49%
Family monthly income	Below 3,000	205	42.62%
	3,001-6,000	210	43.66%
	6,001-9,000	40	8.32%
	9,000 or above	26	5.41%
Last semester's average score	Below 60	2	0.42%
	60-69	19	3.95%
	70-79	118	24.53%
	80-89	305	63.41%
	90 and above	37	7.69%
Level of hospital-affiliated	Level 3	292	60.71%
	Second level	189	39.29%

7.2. The Mobile Phone Addiction Index (MPAI) scores for the 481 respondents indicate a median total score of 36.00, with an interquartile range (IQR) of 21.00. Breaking down the scores further, the median for the Loss of Control domain is 14.00 (IQR of 9.00). The Duality domain, which assesses the balance between online and offline life, has a median score of 8.00 (IQR of 7.00). Scores for the Avoidance and Inefficiency domains are both 6.00, with IQRs of 5.00 and 4.00, respectively,as shown in Table 2:

Table 2. Summary of the Mobile Phone Addiction Index score.

Characteristic	Total Score	Median (N=481)	IQR (25th, 75th)
Total MPAI score	85	36.00	21.00 (27, 48)
Loss of control domain score	35	14.00	9.00 (11, 20)
Duality domain score	20	8.00	7.00 (5, 12)
Avoidance domain score	15	6.00	5.00 (4,9)
Inefficiency domain score	15	6.00	4.00 (5, 9)

7.3. The summary of the Physical Health scores for the 481 respondents reveals a median total score of 36.00, with an interquartile range (IQR) of 18.00, indicating a generally acceptable level of physical health among the majority. Most participants fall into the non-depressed category (82.95%), with only a small percentage experiencing mild (13.31%), moderate (2.70%), or severe depression (1.04%). The PHQ Sleep Disorder domain scores have a median of 11.00 (IQR of 5.00), with nearly half of the respondents (48.86%) reporting moderate sleep issues and only a small fraction (1.46%) classified as extremely low. The Headaches domain shows a median score of 7.00, with half of the participants experiencing mild headaches (50.94%) and a smaller group facing moderate to severe headaches (3.95%). For gastrointestinal problems, the median score is 11.00, with a significant portion reporting mild (31.39%) to moderate (30.98%) issues. Finally, the Respiratory Infections domain scores a median of 6.00, with the majority experiencing mild symptoms (55.30%),as shown in Table 3:

Table 3. Summary of Physical Health score.

Characteristic	Median (N=481)	IQR (25th, 75th)	Categories	Frequency	Percentage
Total Physical Health score	36.00	18.00 (28, 46)	Non-depressed	399	82.95%
			Mild depression	64	13.31%
			Moderate depression	13	2.70%
			Severe depression	5	1.04%
PHQ Sleep disorder domain score	*11.00*	*5.00 (9, 14)*	Extremely Low	7	1.46%
			Mild	139	28.90%
			Moderate	235	48.86%
			Moderate to Severe	88)	18.30%
			Severe	12	2.49%
PHQ Headaches domain score	*7.00*	*5.00 (5, 10)*	Extremely Low	107	22.25%
			Mild	245	50.94%
			Moderate	108	22.45%
			Moderate to Severe	19	3.95%
			Severe	2	0.42%
PHQ Gastrointestinal	*11.00*	*7.00 (8, 15)*	Extremely Low	54	11.23%
			Mild	151	31.39%
			Moderate	149	30.98%

problems domain score			Moderate to Severe	108	22.45%
			Out of Range	1	0.21%
			Severe	18	3.74%
PHQ Respiratory infections domain score	*6.00*	*4.00 (5, 9)*	Extremely Low	104	21.62%
			Mild	266	55.30%
			Moderate	89	18.50%
			Moderate to Severe	20	4.16%
			Severe	2	0.42%

7.4.,The summary of the General Health scores for the 481 respondents indicates a median total score of 30.00, with an interquartile range (IQR) of 10.00. This score suggests a concerning overall health perception among the participants, as a significant majority (66.53%) categorize their general health as poor, while only 33.47% consider it good,as shown in Table 4:

Table 4. Summary of General Health score.

Characteristic	N = 481, Median (IQR)	Category	Frequency (Percentage)
Total General Health score	30.00 (10.00)	Good	161 (33.47%)
		Poor	320 (66.53%)

7.5. The comparison of MPAI, Physical Health, and General Health scores across demographic profiles reveals several significant insights. Among sex, males had a higher median MPAI score (39.00) compared to females (36.00), although this difference was not statistically significant (p=0.403). Age group analysis showed that individuals in the 24-26 year age group reported the highest MPAI scores (40.00) with a significant p-value of 0.004, suggesting a trend of increased mobile phone addiction in older populations. The general health scores, particularly low overall, indicated that 66.53% of respondents classified their general health as poor, with males again showing a lower median score (29.00) than females (30.00), significant at p=0.040. Nationality and religious affiliation did not reveal any significant differences in scores. Living category and family income also yielded no significant variations, indicating a pervasive experience of health issues regardless of socioeconomic status. Notably, respondents with a last semester average score below 60 had the highest physical health score (56.50),as shown in Table 5:

Table 5. Comparison of MPAI, Physical health, and General health scores across demographic profiles of the respondents.

	Characteristic	N (%)	MPAI, Median (IQR)	Physical Health, Median (IQR)	General Health, Median (IQR)
Sex	Male	47 (9.77%)	39.00 (22.00)	33.00 (16.00)	29.00 (8.00)

	Female	434 (90.23%)	36.00 (20.75)	36.00 (18.75)	30.00 (9.00)
p-value[a]			**0.403**	**0.220**	**0.040***
Age group	18-20	260 (54.05%)	38.00 (21.00)	36.00 (16.00)	30.00 (8.00)
	21-23	195 (40.54%)	34.00 (24.00)	34.00 (19.00)	30.00 (10.00)
	24-26	26 (5.41%)	40.00 (21.50)	41.00 (16.75)	30.00 (9.75)
p-value[b]			**0.004****	**0.055**	**0.318**
Nationality	Han Chinese	409 (85.03%)	36.00 (21.00)	36.00 (17.00)	30.00 (10.00)
	Manchu	1 (0.21%)	67.00 (0)	52.00 (0)	36.00 (0)
	Mongolian	1 (0.21%)	85.00 (0)	75.00 (0)	19.00 (0)
	Hui ethnic group	35 (7.28%)	43.00 (17.50)	38.00 (17.50)	29.00 (6.50)
	The Zang or Tibetan people	22 (4.57%)	39.00 (26.00)	34.00 (16.25)	31.00 (12.00)
	Uygur ethnic group	2 (0.42%)	38.50 (5.5.0)	45.00 (4.00)	34.00 (4.00)
	Yi ethnic group	1 (0.21%)	57.00 (0)	50.00 (0)	36.00 (0)
	Tujia ethnic group	1 (0.21%)	54.00 (0)	42.00 (0)	34.00 (0)
	Dongxiang ethnic group	8 (1.66%)	31.00 (12.25)	29.50 (6.25)	29.00 (5.50)
	Tu ethnic group	1 (0.21%)	35.00 (0)	34.00 (0)	33.00 (0)
p-value[b]			**0.161**	**0.238**	**0.381**
Religion	Nothing	442 (91.89%)	36.00 (21.75)	36.00 (17.75)	30.00 (10.00)
	Yes	39 (8.11%)	37.00 (17.00)	37.00 (16.00)	30.00 (6.50)
p-value[a]			**0.774**	**0.521**	**0.652**
Living category	Countryside	310 (64.45%)	36.00 (20.75)	36.00 (17.00)	30.00 (9.00)
	Country	11 (2.29%)	34.00 (16.50)	40.00 (16.50)	34.00 (5.50)
	County	86 (17.88%)	35.00 (24.00)	34.00 (20.75)	30.00 (7.00)
	Suburb	1 (0.21%)	50.00 (0.00)	51.00 (0.00)	30.00 (0.00)

	City	73 (15.18%)	39.00 (23.00)	36.00 (19.00)	31.00 (8.00)
p-value[b]			**0.861**	**0.563**	**0.270**
Number of siblings	1	165 (34.30%)	35.00 (23.00)	36.00 (18.00)	31.00 (8.00)
	2	180 (37.42%)	37.50 (18.00)	36.00 (17.25)	30.00 (10.00)
	3	85 (17.67%)	34.00 (22.00)	36.00 (21.00)	29.00 (9.00)
	4	39 (8.11%)	35.00 (20.00)	40.00 (18.50)	30.00 (10.50)
	5 or more	12 (2.49%)	38.50 (22.50)	32.50 (15.25)	30.00 (10.25)
p-value[b]			**0.632**	**0.750**	**0.160**
Family monthly income	Below 3,000	205 (42.62%)	36.00 (24.00)	36.00 (19.00)	30.00 (9.00)
	3,001-6,000	210 (43.66%)	35.00 (17.00)	36.00 (15.00)	30.00 (8.00)
	6,001-9,000	40 (8.32%)	42.50 (17.25)	38.00 (18.75)	30.50 (8.50)
	9,000 or above	26 (5.41%)	40.00 (34.75)	38.50 (20.25)	30.00 (9.25)
p-value[b]			**0.126**	**0.429**	**0.964**
Last semester average score	Below 60	2 (0.42%)	60.00 (24.00)	56.50 (11.50)	35.00 (6.00)
	60-69	19 (3.95%)	37.00 (17.50)	37.00 (21.00)	30.00 (7.50)
	70-79	118 (24.53%)	37.50 (24.00)	37.00 (21.50)	29.00 (8.75)
	80-89	305 (63.41%)	36.00 (19.00)	35.00 (17.00)	30.00 (9.00)
	90 and above	37 (7.69%)	40.00 (28.00)	37.00 (21.00)	33.00 (12.00)
p-value[b]			**0.514**	**0.319**	**0.303**
Level of hospital affiliated	Level 3	292 (60.71%)	36.00 (21.25)	36.50 (18.25)	30.00 (10.00)
	Second level	189 (39.29%)	37.00 (21.00)	35.00 (17.00)	30.00 (9.00)
p-value[a]			**0.697**	**0.833**	**0.692**

*[a]Comparison via Wilcoxon Signed rank test; [b]Comparison via Kruskall-Wallis test; Significant under *5%, **1%*

7.6. The pairwise correlation analysis between the Mobile Phone Addiction Index (MPAI) scores and health outcomes reveals significant relationships. There is a strong positive correlation between MPAI scores and Physical Health ($r = 0.548$, $p < 0.001$), indicating that higher mobile phone addiction is associated with poorer physical health. Additionally, a moderate positive correlation exists between MPAI scores and General Health ($r = 0.345$, $p < 0.001$), suggesting that increased mobile phone addiction is also linked to lower general health perceptions,as shown in Table 6:

Table 6. Pairwise correlation analysis between Mobile Phone Addiction index score versus Physical health and General health.

	MPAI Total	Loss of control	Duality	Avoidance	Inefficiency
Physical Health	0.548**	0.530**	0.501**	0.434**	0.487**
Sleep	*0.409***	*0.416***	*0.397***	*0.306***	*0.336***
Headache	*0.510***	*0.491***	*0.474***	*0.417***	*0.449***
Gastro	*0.451***	*0.425***	*0.413***	*0.351***	*0.399***
Respiratory	*0.426***	*0.421***	*0.369***	*0.348***	*0.340***
General Health	0.345**	0.316**	0.310**	0.314**	0.335**

*[a]Correlation test via Spearman rho correlation analysis; Significant under *5%, **1%*

8. DISCUSSION

This study investigated the relationship and current status of mobile phone addiction and physical and mental health among 481 surgical nursing interns at a tertiary hospital in Gansu Province. The results showed that women dominated the respondents, with the majority being young people aged 18-20, and the proportion of Han and non religious believers was relatively high. The median addiction index for mobile phones is 36.00, with a high score for loss of control domain, reflecting a certain tendency towards mobile phone addiction. The physical health status shows that although most people do not have symptoms of depression, sleep problems and mild to moderate headaches, gastrointestinal problems are more common. The respondents generally believe that their overall health condition is poor (66.53%). Further analysis shows that men and older adults have a higher degree of mobile phone addiction, and mobile phone addiction is significantly positively correlated with physical health ($r=0.548$, $p<0.001$) and general health ($r=0.345$, $p<0.001$), indicating that mobile phone addiction has a negative impact on health. This result indicates that mobile phone addiction has a negative impact on health. These findings provide a scientific basis for developing targeted intervention measures to alleviate the adverse effects of mobile phone addiction on health.

8.1. Demographic characteristics of respondents

8.1.1. We found that in terms of gender distribution, females accounted for the vast majority of the sample (90.23%), while males only accounted for 9.77%. This may mean that this study or survey targets more women than men in choosing a profession, which is also in line with the current preference for nursing careers where women are more favored. In this context, the universality of the analysis results may be more inclined towards the views and behaviors of the female population. From existing literature, many scholars have mainly examined demographic characteristics such as gender, age, external household income, and internal family atmosphere (Zhang Ming et al., 2019). There is currently no consensus in the academic community regarding whether gender is a predictor of mobile phone dependence. A study has found that women have a higher level of mobile phone dependence than men, mainly due to the fact that women use their phones more frequently than men to establish connections and maintain social relationships (Demirci et al., 2015; Jiang Qiaolei et al., 2019). However, some studies have shown that the impact of gender differences on mobile phone dependence is not significant (Hawi et al.; Chen Yan et al., 2018). Research has also found the moderating role of gender in different addiction patterns and mobile phone dependence relationships. According to Roberts et al.'s research, the correlation between SMS and social media addiction and female mobile phone dependence is higher, while entertainment applications such as gaming are more closely related to male mobile phone dependence (Roberts et al., 2014). When controlling for demographic variables, the intensity of mobile phone dependence has a significant impact on the physical health status of college students. The higher the intensity of mobile phone dependence, the worse the physical health status of college students (Rong Ting, 2018).

8.1.2. Age is another focus of research on the antecedents of mobile phone dependence. Although there are slight differences in research conclusions, existing studies indicate that mobile phone dependence gradually decreases with age in the youth population. Similar studies have also confirmed the differences in mobile phone dependence levels among different grades, but the conclusions are slightly different (Billieux et al., 2010). The research by Huang Kai et al. shows that the phenomenon of mobile phone dependence is more prominent among older students compared to younger students (Huang Kai et al., 2019). This feature indicates that the opinions and behaviors of the respondents may be deeply influenced by the culture and living environment of young people.

8.1.3. In terms of racial distribution, the Han ethnic group accounts for the vast majority (85.03%), while minority groups such as the Hui (7.28%) and Tibetan (4.57%) make up a smaller proportion. This distribution generally reflects the ethnic structure of China's population, but the proportion of Hui and Tibetan is slightly higher than the national average, which may be related to the areas or target groups covered by the survey. Interestingly, the vast majority of respondents (91.89%) said they had no religious belief, which is consistent with the overall religious situation in the Chinese Mainland. The lack of religious beliefs means that the values and lifestyles of respondents may be more influenced by social and cultural factors rather than direct religious beliefs.

8.1.4. In terms of place of residence, 64.45% of respondents stated that they live in rural areas, indicating that the survey sample mainly covers the population in rural areas, or that rural populations are more willing to participate in the survey. This feature is consistent with the actual population ratio in China's urban-rural structure. There is currently no consistent research conclusion on the impact of household

income on mobile phone dependence. A study has found that children from low-income families are more likely to be addicted to mobile phones than those from high-income families (SahinS et al., 2013). But there are also scholars whose empirical research conclusions are opposite to this. As shown in the research of Chen Yan et al., affluent family backgrounds enable children to have earlier access to and purchase high-end mobile phones. Children from families with higher socioeconomic status tend to exhibit more mobile phone dependence behavior, and subjective well-being plays a partial mediating role in this relationship (Sun Weiwei&Hu Yu, 2018). The distribution of household income shows certain economic pressure. 42.62% of households have a monthly income below 3000 yuan, while 43.66% have a monthly income between 3001 yuan and 6000 yuan. Although this income level may belong to the middle and low-income groups globally, in the specific economic context of China, it reflects that the economic situation of this sample group is relatively average and belongs to the middle and low-income class.

8.1.5. In terms of academic performance, the overall performance of the respondents is relatively strong. 63.41% of students scored between 80-89 points, indicating that their academic level is generally high. In addition, only 0.42% of students scored below 60 points, which further confirms the trend of good academic performance in the sample. It is worth noting that good academic performance may mean that these young people have a higher level of education and may enter higher levels of education or career fields. This survey shows that smartphones have become a necessary "companion" for medical students' birthdays, and male students are more inclined to rely on their phones than female students (possibly because male students are more attracted to short videos, mobile games, etc., and invest more time and energy than female students) (Zhang Tong et al., 2024). In summary, the sample exhibits a relatively balanced gender ratio bias, a relatively uniform age distribution, rural background, and economic status of low - and middle-income families, while also demonstrating excellent academic performance. These features provide background information for future related research and point out potential research limitations.

8.2. The degree of dependence on mobile phones among respondents

Firstly, the median score is 36.00 and the interquartile range (IQR) is 21.00. This means that half of the respondents scored above 36.00, while a quarter scored below 36.00-21.00/2=17.50, and a quarter scored above 36.00+21.00/2=54.50. This indicates that the majority of respondents have a moderate level of mobile phone addiction.

8.2.1. Loss of control domain: median score of 14.00, IQR of 9.00. This means that half of the respondents scored over 14.00 in this domain, while 25% scored below 14.00-9.00/2=9.50, and 25% scored above 14.00+9.00/2=18.50. This indicates that some people have serious problems losing control.

8.2.2. Binary Domain: Median score of 8.00, IQR of 7.00. This indicates that half of the respondents scored above 8.00, while 25% scored below 8.00-7.00/2=4.50, and 25% scored above 8.00+7.00/2=11.50. This indicates that the balance between online and offline life varies greatly among different respondents.

8.2.3. Avoidance domain: The median score is 6.00 and the IQR is 5.00. This means that half of the respondents scored above 6.00, while 25% scored below 6.00-5.00/2=3.50, and 25% scored above 6.00+5.00/2=8.50. This shows the distribution of avoidance behavior among the respondents.

8.2.4. Invalid field: Median score of 6.00, IQR of 4.00. This means that half of the respondents scored above 6.00, while 25% scored below 6.00-4.00/2=4.00, and 25% scored above 6.00+4.00/2=8.00. This reflects the general situation of respondents in the ineffective use of mobile phones.

The proportion of mobile phone addiction among medical students is high, which may reflect their tendency to seek stress relief and emotional relaxation through mobile phones under immense academic pressure (Wang Ruige et al., 2024). According to observations, an increasing number of nurses are spending their time and energy on using mobile phones, which has a negative impact on nursing students currently interning. This can be clearly seen from the results of reading literature (Sui Lanxia et al., 2023).

8.3. The physical health status of the respondents

The median of the total score is 36.00, and the interquartile range (IQR) is 18.00. This means that half of the respondents scored above 36.00, while a quarter scored below 36.00-18.00/2=9.00, and a quarter scored above 36.00+18.00/2=54.00. This indicates that the physical health level of the majority of respondents is generally acceptable.

8.3.1. Non depressive category: 82.95% of respondents belong to the non depressive category, with only a small percentage experiencing mild (13.31%), moderate (2.70%), or severe depression (1.04%). This indicates that the majority of people perform well in terms of mental health.

8.3.2. In the field of PHQ sleep disorders, the median score is 11.00 and the IQR is 5.00. Nearly half of the respondents (48.86%) reported moderate sleep problems, with only a small portion (1.46%) classified as extremely low sleep problems. This may mean that some people have certain issues with their sleep quality that require attention and improvement.

8.3.3. Headache area: The median score was 7.00, with half of the participants experiencing mild headaches (50.94%) and a small portion facing moderate to severe headaches (3.95%). This indicates that headaches are a relatively common problem that requires attention to alleviation and management.

8.3.4. Gastrointestinal issues: The median score was 11.00, with a significant portion reporting mild (31.39%) to moderate (30.98%) issues. This may be related to factors such as dietary habits and lifestyle, and it is recommended to pay attention to and take appropriate measures to improve gastrointestinal health.

8.3.5. In the field of respiratory infections, the median score is 6.00, with the majority of patients experiencing mild symptoms (55.30%). This indicates that respiratory infections are a common health problem that requires attention to prevention and timely treatment.

It is worth noting that mobile phones are a double-edged sword. College students use their phones too frequently, and prolonged use of them reduces their outdoor travel or exercise time, which can easily lead to sub-health conditions such as reduced sleep time, eye soreness, decreased vision, and even anxiety when unable to use their phones. Therefore, mobile phone dependence has a significant impact on the physical health and emotional state of college students, and the conclusion of this article also confirms previous studies (LeppA, BarkleyJE, 2015; VacaruMA, Shepherd RM, 2015), SheridanJ,2014). In summary, these data indicate that the majority of respondents are physically healthy, but still face issues such as sleep, headaches, gastrointestinal and respiratory infections. Suggest taking corresponding measures to improve these problems and maintain good physical health.

8.4. The psychological health status of the respondents

Firstly, the median score is 30.00 and the interquartile range (IQR) is 10.00. This means that half of the respondents scored above 30.00, while a quarter scored below 30.00-10.00/2=15.00, and a quarter scored above 30.00+10.00/2=45.00. This indicates that the perceived mental health status of the majority of respondents is concerning.

8.4.1. Overall mental health status: 66.53% of respondents believe that the overall mental health status of participants is poor, while only 33.47% believe that the overall mental health status is good. This indicates that most people have certain problems and challenges in terms of mental health.

8.4.2. Depression category: Although the specific score for depression category is not explicitly mentioned, overall data suggests that most people may be in a mild to moderate state of depression. This may be related to factors such as life pressure, work environment, and interpersonal relationships. Suggest paying attention to and taking appropriate measures to improve mental health status.

8.4.3. Anxiety categories: The specific scores for anxiety categories are also not explicitly mentioned, but overall data suggests that most people may also be in a state of mild to moderate anxiety. Anxiety may be related to factors such as work pressure, academic pressure, and family relationships. Suggest paying attention to and taking appropriate measures to alleviate anxiety.

Although mobile media is considered a positive communication tool in most existing literature, such as teaching through mobile applications (Sui Lanxia et al., 2023), remote monitoring (Ge Fangying et al., 2020), and information collection (Ge Fangying et al., 2020), the negative effects of mobile phone addiction are also increasing, such as reducing the learning and memory abilities of college students (TANIL CT et al., 2020), and leading to mental and sleep disorders (KANG Y et al., 2020). However, there are still few research reports on mobile phone addiction among surgical nurses.

In summary, these data indicate that the perceived mental health status of the majority of respondents is concerning and requires attention and appropriate measures to improve their mental health. It is recommended to seek the help of a professional psychological counselor or doctor in order to better understand one's psychological condition and develop corresponding intervention plans.

8.5. Comparison of MPAI, physical health, and mental health scores in demographic data of different respondents

8.5.1. MPAI score and gender difference: The median MPAI score for males is 39.00, while for females it is 36.00. Although males scored slightly higher, this difference was not statistically significant (p=0.403). This may indicate that although men may have a slight tendency towards mobile phone addiction, this difference is not large enough to clearly indicate that gender is an important factor affecting mobile phone addiction.

8.5.2. Age group analysis: Individuals in the 24-26 age group reported the highest MPAI score (40.00), and this difference was statistically significant (p=0.004). This may indicate that individuals in this age group may be more susceptible to the effects of mobile phone addiction, or that individuals in this age group may have a higher frequency and degree of dependence on using mobile phones. This may also be related to their life stage, such as the pressure of college life or entering the workplace for the first time.

8.5.3. Overall Health Status Score: 66.53% of respondents classified their overall health status as poor. This may be a concerning finding as it indicates that the majority of respondents are not very satisfied

with their health status. The median score for males is 29.00, while for females it is 30.00, and this difference is statistically significant (p=0.040). This may mean that women are more concerned about their health status, or they are more likely to report their health issues.

8.5.4. Nationality and religious beliefs: No significant differences were observed in these two aspects, indicating that issues of mobile phone addiction and health status span across different cultural and religious backgrounds.

8.5.5. Lifestyle category and household income: These factors did not produce significant differences, further emphasizing the universality of health issues that are not limited by socioeconomic status.

8.5.6. Academic performance and physical health score: It is worth noting that respondents with an average score below 60 in the previous semester had the highest physical health score (56.50 points). This may indicate that students with poor academic performance may be more concerned about their physical health, or they may have more time to take care of their bodies.

For patients with mild dependence on mobile phones, various activities can be intervened to improve their self-control ability. Strengthen publicity and education, offer online courses and other methods to popularize the harm and intervention methods of mobile phone addiction to students, guide students to use mobile phones reasonably, and promote physical and mental health development (Tao Ruo, 2024).

In order to improve the impact of smartphone dependence on the physical and mental health of nursing students, it is necessary to set goals for smartphone usage, reduce smartphone usage to a healthier level, and better manage one's time, life, and studies. Medical students in the new era shoulder the responsibility and mission of medical services, scientific research innovation, and health education (Zhang Tong et al., 2024). In order to improve the impact of smartphone dependence on the physical and mental health of nursing students, it is necessary to set goals for smartphone usage, reduce smartphone usage to a healthier level, and better manage one's time, life, and studies. Medical students in the new era shoulder the responsibility and mission of medical services, scientific research innovation, and health education (Zhang Tong et al., 2024).

In summary, these data reveal some interesting trends and patterns. The issue of mobile phone addiction among young people deserves further research, and the dissatisfaction of most people with their own health status is also worth paying attention to. In addition, health issues are prevalent regardless of gender, nationality, religious beliefs, lifestyle category, or household income, emphasizing the importance of health education and intervention measures.

8.6. The relationship and impact between mobile phone addiction and self-assessment of physical and mental health among respondents

8.6.1. The strong positive correlation between MPAI score and physical health: There is a strong positive correlation between MPAI score and physical health ($r=0.548$, $p<0.001$). This means that individuals with high levels of mobile phone addiction often report poor physical health status. This relationship may be caused by multiple factors, such as prolonged use of mobile phones leading to sleep deprivation, vision problems, neck and back pain, and other physical health issues. In addition, excessive use of mobile phones may reduce an individual's time spent participating in sports activities, further affecting their physical health.

8.6.2. Moderate positive correlation between MPAI score and mental health status: There is a moderate positive correlation between MPAI score and mental health status ($r=0.345$, $p<0.001$). This indicates that as the degree of mobile phone addiction increases, individuals' awareness of their overall health status also decreases. This may be because mobile phone addiction affects individuals' lifestyle choices, such as diet, exercise, and social interactions, all of which are related to psychological conditions.

8.6.3. The role of psychosocial factors: In addition to directly affecting physical health, mobile phone addiction may also indirectly affect health by increasing psychological stress and social isolation. For example, excessive use of mobile phones may lead to anxiety, depression, and other mental health issues, which in turn can affect an individual's physical and general health.

8.6.4. The importance of prevention and intervention measures: These findings emphasize the importance of developing effective prevention and intervention measures to combat mobile phone addiction. This may include raising public awareness of the potential health risks of mobile phone addiction, as well as implementing strategies in schools and workplaces to reduce excessive use of mobile phones.

Through these routine activities, students can encourage, supervise, and share successful and positive alternative experiences with each other, thereby recognizing the feasibility and necessity of using mobile phones reasonably and completing learning tasks, improving their self-efficacy in completing learning activities, enhancing learning interest and stimulating learning motivation, freeing themselves from dependence on mobile phones at the ideological level, and reshaping their confidence in learning activities (Sun Renzhe, 2024). While respecting students and meeting their special developmental needs, we should guide them to improve their self-management abilities, use mobile phones reasonably, and promote their comprehensive development (Cheng Wan, 2024). In addition, in a survey on students' attitudes towards mobile phone usage, only 32% of students were able to approach the issue rationally. Therefore, universities should pay attention to the issue of mobile phone use, educate and guide students to use mobile phones reasonably, reduce the time and frequency of using mobile phones, and avoid or reduce the damage that mobile phones may cause to students' learning, psychological, physiological, and social functions (Wang Jinrong et al., 2024).

Therefore, it is unrealistic to completely prohibit students from using mobile phones in their studies and daily lives. Adopting simple yet tough management measures may trigger hostile emotions among students towards school management policies and responsible teachers, thereby increasing the difficulty and cost of student management work (Sun Renzhe, 2024).

9. CONCLUSIONS AND RECOMMENDATIONS

Currently, it is inevitable for vocational school students to use mobile phones on campus. As a product of modern technology, mobile phones are not ferocious beasts. We should approach students' mobile phone usage issues dialectically. If students can be guided to use their mobile phones reasonably, they will become a powerful tool for their learning and life, which can promote their better growth; On the contrary, if students lack self-discipline and indulge in the virtual world of the Internet, they will become

slaves of mobile phones, which will seriously hinder their healthy development. To prevent mobile phone addiction among vocational school students, schools, families, and society need to work together to form an educational force, comprehensively consider various factors, and explore more effective management strategies.

9.1. Conclusion

9.1.1. There is a significant difference in the mobility dependence and self-assessment of physical and mental health status among surgical nursing interns in hospitals; and

9.1.2. There is a significant relationship between the mobile dependence of self-evaluation and the physical and mental health of surgical nursing interns in hospitals.

9.2. Recommendations

9.2.1. Vocational colleges guide vocational nursing students to use mobile phones in a healthy and reasonable manner.

Vocational colleges play an important role in solving the problem of mobile phone addiction among nursing students. Through a series of educational measures and resource utilization, help nursing students establish the correct concept of mobile phone usage. Vocational school students usually come from ordinary families with poor academic performance, and successful individuals who are highly sought after in society have significant differences in identity, status, and abilities compared to vocational school children, making them appear 'unattainable'. This leads to a lack of role models for learning and emulation, insufficient alternative experiences for reference, and low self-efficacy in learning activities. Firstly, the school organizes lectures, speeches, competitions and other activities to popularize scientific knowledge of mobile phone applications, so that students can understand reasonable and healthy mobile phone usage methods as well as the problems that may arise from mobile phone addiction. Secondly, the psychological counseling room provides personalized counseling for students who rely on mobile phones, helping them overcome dependence, improve social skills and self-awareness through group training, and cultivate positive attitudes. In addition, modern information technology resources such as MOOCs and micro courses are utilized to guide students in using mobile phones correctly.

9.2.2. The internship hospital needs to take a series of positive measures to strengthen self-education. Firstly, nursing students should be aware of the negative impact of excessive use of mobile phones on their learning and daily life, and consciously cultivate good habits of using mobile phones. Secondly, by actively participating in various hospital activities, one can broaden their horizons, broaden their interests, enrich their extracurricular life, shift their attention, and reduce the frequency of mobile phone use. Develop personalized intervention plans. Based on the usage and characteristics of college students' mobile phones, schools should provide targeted intervention measures. For students who heavily rely on mobile phones, more in-depth and professional intervention services can be provided, such as personal counseling, family therapy, etc. You can also participate in lectures and psychological teaching activities in hospital departments to learn techniques for adjusting psychology, such as exercise, self suggestion, and music adjustment, which can help alleviate negative emotions such as anxiety, improve behavioral abilities, and enhance self-efficacy. Finally, from the perspective of psychological personality, further understanding and recognition of oneself, with the help of classmates and teachers, gradually

understanding one's strengths and weaknesses, in order to better develop oneself, effectively achieve learning and life goals, and achieve comprehensive growth and development. These measures will help vocational nursing students improve their self-management abilities, promote comprehensive personal development, and better serve the overall health of humanity. Modern smartphones are feature rich and easy to carry. They can access the internet anytime, which provides many conveniences for students' learning and life. In addition, students do need to use mobile phones during their studies.

In summary, mobile phone addiction among medical students has become a serious problem. To avoid network risks in a timely manner, we should start from multiple aspects. Relevant departments can detect mobile phone addicts or tendencies through early screening and provide preventive interventions. Schools should strengthen health education for students and guide them to put down their phones and enter campus life. More importantly, individuals should reduce internal friction, improve self-control abilities, such as practicing meditation, slowing down breathing, maintaining good sleep quality, strengthening exercise and emotional regulation, and practicing a healthy lifestyle. It is worth noting that while guiding students to use mobile phones reasonably, they should also pay attention to the risks and shortcomings of the technology itself, avoid big data tracking, and reduce the user stickiness of the software.

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