Original Research Article

ROLE OF REPETITIVE TRANSCRANIAL MAGNETIC STIMULATION (RTMS) INTERVENTION ON SMARTPHONE ADDICTION, PSYCHOLOGICAL WELL-BEING AND SUBJECTIVE WELL-BEING AMONG MEDICAL COLLEGE STUDENTS

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A B S T R A C T

Background: Globally, India ranks second in telecommunication, subscription, and downloading applications. Excessive usage of the smartphone has negative effects not just physical health but also on psychological effects like sleep deficit, stress, anxiety, and depression. rTMS has been shown to be effective intervention for depression, specifically in individuals who do not respond to conventional therapies. By targeting special regions in brain like DLPFC, rTMS modulates neural-activity, improving mood regulation and alleviating symptoms of depression.

Materials and Methods: This is a cross sectional, self administered questionnaire based study followed by rTMS intervention in moderate to severe depression participants. The questionnaire was forwarded to medical students as google forms. The questionnaire included a Smartphone addiction scale, flourishing scale, and DASS questionnaires. Data was analyzed by descriptive and inferential statistics.

Results: The study revealed that almost 45.8% of students exhibited high smartphone addiction scores, significantly associated with lower subjective well being, stress, anxiety, and depression. Stress is correlated with anxiety and depression among students which is statistically significant (p < 0.0001). In terms of rTMS intervention, the application of low frequency stimulation to the superior frontal gyrus, high-frequency rTMS to the dorsolateral prefrontal cortex(DLPFC), along with bilateral DLPFC stimulation demonstrated potential benefits in alleviating depression and anxiety symptoms linked to smartphone addiction.

Conclusion: The present study identified a relatively high level of smartphone addiction among students initiated the role of Neuromodulation. Further research and initiatives may be required to address in-depth rTMS areas that would target stress, anxiety, and depression concerning Smartphone addiction.

Keywords: Medical College students, rTMS, Neuromodulation, Smartphone addiction, psychological manifestations, Depression, Anxiety, and Stress.

INTRODUCTION

Smartphone usage has increased to three fold since 2010, which is 6.319 billion by April 2019 (World bank information & communication for development, 2019). Following the COVID pandemic, internet and smartphone use has been

moved from luxury to a necessity. Recent development in multifunctional features in the smartphone attract children as well as adolescents equally changing their interests, values, and desires (Panova T., et al 2018).

Globally, India ranks second in telecommunication, subscription, downloading applications. Young adults (aged 16 to 30 years) are a high-risk group for excessive smartphone usage (Prabakaran MC., et al 2016). Excessive smartphone usage negatively impacts both physical health and psychological well-being, leading to issues like sleep deficits, anxiety, stress, and depression (De-sola Gutierrez et al., 2016). A study conducted in Hyderabad among college students revealed that physical symptoms like headache (51.47%) anger & irritability (50.79%) and other symptoms like lack of concentration, insomnia and anxiety were associated with smart phone addiction (Ajanta P Acharya et al 2013). Lin et al., (2014) in their study highlighted smart phone addiction as a form of technological addiction; it is a form of non-chemical behavioral disorder proposed for inclusion in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). Studies have also emphasized that a student and an employee without a smart phone will miss most of the important and instant updates and won't be able to work on digital files, as and when required (Ramesh khan, and Ian Linton, 2012). For the purpose of improve the regulation of mood, repetitive transcranial magnetic stimulation (rTMS), a non-invasive treatment for depression, targets specific brain areas, such as the dorsolateral prefrontal cortex. Research has demonstrated that rTMS significantly reduces depression symptoms, especially in cases that are resistant to treatment (George et al., 2010; Loo et al., 2010). rTMS has benefits over antidepressant drugs, including fewer adverse effects, no systemic drug interactions, and no danger of reliance. Because of this, rTMS is a desirable substitute for long-term depression treatment. To Address the psychological issues associated with smartphone addiction, the study explores the potential role of rTMS as a non-invasive intervention for students displaying severe anxiety and depression. Repetitive transcranial magnetic stimulation is a non-invasive technique of neuromodulation that utilizes magnetic pulses to stimulate particular parts of the human brain. It was introduced in the early 1990s by Anthony Barker and colleagues, ever since, rTMS has been recognized as a promising intervention for various psychological disorders, including depression and anxiety. This study was conducted to determine the association between smart phone addiction, psychological manifestations, and subjective wellbeing among medical college students, and evaluate the effect of rTMS on moderate to severe depression associated with smart phone addiction.

MATERIALS AND METHODS

This prospective, analytical study was conducted at the Government Medical College in Nizamabad, Telangana in collaboration with Karla Mind & Neuromodulation, Hyderabad, the study included students who were willing to give written informed consent. Assessments of psychological well-being, subjective well-being, and smartphone addiction were all part of the questionnaire. Over the course of two weeks, ten sessions of rTMS were administered, each lasting twenty minutes, at at a frequency of 10 Hz (high-frequency stimulation) for the right dorsolateral prefrontal cortex (DLPFC) and 1 Hz (low-frequency stimulation) for the left DLPFC.

Statistical Analysis:

Sample size was calculated, based on the study conducted by Ruchi Soni et al, (2017), where 33% (95 % CI: 29.58, 37.37) were high users of the smart phone as estimated by Smart Phone Addiction Scale (SAS). With the expected proportion of 0.33, 6% precision, 95% confidence interval, the study required totally 260 participants.

The data collection instrument was designed with four segments. First segment involved the socioeconomic status of the students, along with the pattern of mobile phone usage.

Second segment is the Smartphone addiction scale developed by Kwon W, et al (2013) Short version. Smartphone addiction scale was developed by Kwon W, et al in collaboration with the Korea Agency for Digital Opportunities and Seoul National University in the year 2013. SAS-SV is a scale for smartphone addiction that consists of 6 factors and 10 items with a six-point Likert scale based on self-report. The total score ranges from 6-60. A higher score indicates a high level of smartphone addiction and a low score indicates low smartphone addiction. Each item is scored as 1-6 on a Likert scale as strongly disagree to strongly agree. The Smartphone Addiction Scale-Short version (SAS-SV) is a reliable and valid tool with an internal consistency of 0.96. Third segment is the DASS (Depression, Anxiety and Stress scale). The DASS scale was designed by S.H. Lovibond and P. F. Lovibond at the University of New South Wales in 1995. It is a self-report scale 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 scores for each subscale are summed, ranging from 0-21 and the total score on each subscale was multiplied by 2 to calculate the final score. The higher the scores indicate the higher the severity of psychological distress. Each item is scored 0-3 on a 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 to a considerable degree, or a good part of the time, 3= Applied to me very much, or most of the time. It has been tested at various canters across India. Literature reports

internal consistency (Cronbach's alpha 0.84-0.91) and reliability. The reliability of the DASS-21 in the study population was αdass_T1 = 0.95 (αdass_T1 = 0.91 for depression subscale), and αdass_T2 = 0.92, and (αdass_T2 = 0.86 for depression subscale) (Beauforta N., et al). The fourth segment is the Flourishing Subjective wellbeing scale (Diener, R 2009). This scale is an 8-item scale that measures the relationship, self-esteem, purpose in life, and optimism (Diener, R 2009). It is a scale for subjective wellbeing that consists of 7 factors and 8 items with a seven-point Likert scale based on self-report. The 8 items are as follows, leading a meaningful life, social relationships, daily activities, contribution to wellbeing, competency level, optimism, and respect. Each item is scored as 1-7 on a Likert scale as strongly disagree to strongly agree. The interpretation involves adding the responses, varying from 1 to 7, for all eight items, the possible range of scores is from 8 (lowest possible) to 56 (highest possible). The total score ranges from 8-56. A high score represents a person with many psychological resources and strengths. The Cronbach's alpha reported is 0.88-0.95.

As an addition to the data collection, an experimental intervention using repetitive Transcranial Magnetic Stimulation (rTMS) was applied to a subset of participants identified with moderate to severe smartphone addiction scores. This is a non-invasive procedure that uses magnetic fields to stimulate specific areas of the human brain. Protocol targeted for rTMS sessions was the dorsolateral prefrontal cortex (DLPFC), a Brain region associated with addiction and self-control. The treatment protocol of each session lasting approximately 20 minutes conducted twice to thrice weekly to see potential effective changes.

The procedure was administered by a trained clinician using a standardized protocol with the recommended frequency along with prechecked motor threshold intensity. Pre- and post-intervention, the participants were administered the psychometric scales like smartphone Addiction Scale (SAS) and the DASS to measure any potential changes in smartphone addiction symptoms and associated emotional distress or depression, anxiety, and stress.

RESULTS

260 medical students completed the study. Majority, 193 (74.23%) were female and 231(88.85%) were Hindus. 175 students (67%) were in the age group of 17-19 years. Medical students were spread across all the years of training, 95 students (36.5%) were in first year, 80 students (30.57%) were in second year, 45 (17.3%) in third year and 40 (15.3%) in final year of MBBS, at the time of conducting the study. Majority (54.2%) of the college students had low-level smartphone addiction and remaining (45.8%)

students had high-level smartphone addiction. The most common application of use is YouTube.

Psychological manifestations of college students: Analysis of the DASS scale revealed that 29.2% of students reported no stress, 60.8% students reported mild level of stress, and only 10% of students reported a moderate level of stress. Anxiety scores revealed that 11.1% of students reported no anxiety, 37.3% of students have a mild level of anxiety, 37.7% has got a moderate level of anxiety, 12.3% experiencing severe anxiety and only 1.5% students undergoing extreme levels of anxiety. Depression scores revealed that 13.5% had no depressive symptoms, 27.3% of students has a mild level of depression, 53.1% has got a moderate level of depression, 5.8% experiencing severe depression and only 0.4% students undergoing extreme levels of depression.

Subjective wellbeing among college students: Majority (54.2%) of the students had the 'highest possible physical wellness', while 45.58% had the 'lowest possible wellness'.

Table 1 shows that there is a negative correlation between smartphone addiction and physical well-being and it is statistically significant (p<0.005). Statistical significance is seen between smartphone addiction with stress, anxiety, and depression. Stress is correlated with both anxiety and depression among college students which is statistically significant (p<0.0001).

The current study reported that there is a significant association found between smartphone addiction and demographic variables such as gender (p=0.01), Educational status(p=0.03), checking phone more than 15 times (p=0.002), number of hours of use with the maximum of 21-24 hours in a day(p=0.000), perception of ill health with smartphone use during the pandemic, with the ill health of headache and eye strain (0.000), and statistically significant evidence of changes of smartphone use during COVID pandemic (0.001).

The statistical significance of DASS and demographic variables. Stress with the religion of the students, father's education, number of hours they keep the smartphone with them, checking the phone without any reason, and perception of ill health due to smart phone use is statistically significant. Anxiety is significant with whom they live with and fathers' occupation. Depression is statistically significant in students especially with the category with whom they live.

Linear regression analysis was done to examine whether age, gender, type of family, education and occupation of parents, income of the family and patterns of smartphone use predict the overall stress, anxiety and depression levels. The following variables were significant predictors of Stress: Age (reference category: 10-12 years: 13-15 years: β = -2.91, p < .04, 16-18 years: β = -3.05, p < .03, 19-21 years: β = -3.89, p < .00). Gender (reference category: males; females: β = -1.19, p < .02).

Father's education (reference category: illiterate; primary education: β = 2.58, p < .01), Undergraduate and post graduate: β = 2.0, p < .04). Fathers' occupation (reference category: unemployed; skilled labor: β = 8, p < .03, unskilled labor: β = 5.63, p < .03, professionals; β = 6.44, p < .02, business; β = 7.5, p < .01). Amount spent to recharge per month (reference category 100-200 rupees; 201-300 rupees: β = 1.39, p < .01, 301-400 rupees: β = 2.67, p < .00, > 500 rupees: β = 1.70, p < .04). Number of hours they speak over the phone (reference category: < 30 minutes; > 6 hours: β = 3.63, p < .00). Number of hours they keep smartphone with them (reference category: < 5 hours; 6-10 hours: β = 1.72, p < .01, 21-24 hours: β = 2.23, p < .00). Upgrading software in a year (reference category: once a year; 4-5 times: β = 1.99, p < .03). Perception of ill health due to smartphone use (reference category: no ill health; Eyestrain: β = 2.71, p < .00, Neck pain: β = 2.09, p < .00, Disturbed sleep: β = 2.39, p < .00).

The following variables were significant predictors of Anxiety: gender (β = -1.12, p=0.02) fathers education, (primary education β = 1.88, p= 0.04), amount spent to recharge per month(> 500 rupees β = 1.69, p= 0.03), living with friends (β = 10.16, p= 0.00), perception of ill health due to smart phone use: Eyestrain (β = 2.47, p=0.00) Neck pain (β = 1.46, p= 0.04). Results showed that age, religion, type of family, income of the family, number of times they check and number of hours they use the smart phone were not significant predictors (p > 0.05).

The following variables were significant predictors of Depression: whom they live with family (β = 4.95, p= 0.03), friends (β= 14, p= 0.00). Perception of ill health due to smart phone: Eyestrain (β = 2.26, p= 0.00), disturbed sleep (β= 1.84, p= 0.03).

Logistic regression done examining the associations between demographics and Smartphone usage patterns with the smart phone addiction scale, the following variables were significant predictors of Smartphone addiction: Gender (reference category: males; females: OR=0.48, p < .01). Number of hours they keep smart phone with them (reference category: < 5 hours; 11-15 hours: OR=3.99, p<.00; 21-24 hours: OR= 4.08, p < .00). Upgrading the software in a year: (reference category: once a year; 4-5 times: OR = 3.02, p <.02). Pattern of usage of smartphone during pandemic (reference category: no change in usage pattern; more than usual: OR= 2.45, p < .00). Perception of ill health due to smartphone (reference category: no perceived ill health; Headache: OR= 2.86, p < .011; Eyestrain: OR= 4.81, p < .00; Neck pain: OR = 3.90, p < .003; Disturbed sleep: OR = 9.23, p < .00). The common app used during the pandemic (reference category: Google search engines; all the other apps (WhatsApp, Youtube, Music and Games): OR = 5.74, p < .01).

Logistic regressions examining the associations between demographics and flourishing scale, the following variables were significant: mother's education (reference category: illiterate; higher secondary education: OR = 0.28. p < .01); Number of times they check the phone in a day: (reference category: once a day; 6-10 times in a day: OR= 0.21, p <.01). Amount of recharge per month: (reference category: 100-200 rupees per month; > 500 rupees per month: OR=0.38, p <.04). Perception of ill health due to smart phone (reference category: no perceived ill health; Headache: OR= 2.46, p < .01).

rTMS therapy, concentrating on low frequency on the superior frontal gyrus, and Bilateral DLPFC stimulation (low- frequency for the left side and high frequency for the right side) high-frequency protocol for target regions like the Dorsolateral Prefrontal cortex (DLPFC).

The smartphone addiction scores pre-intervention and post-intervention were reassessed and evaluated and the scores displayed a reduction in addiction symptoms indicating noticeable improvement. Compared to the pre-test scores, the post-test scores reflected a better outcome with reduced addiction scores indicating that Neuromodulation rTMS therapy is an effective intervention in alleviating symptoms of smartphone addiction.

Table 1: Correlation between Smartphone addiction and psychological manifestations

Category	Pearson's Correlation coefficient®	p-value
Smartphone and flourishing scale	-0.1706	< 0.005**
Smart phone and Stress	0.2624	< 0.0001***
Smart phone and Anxiety	0.2775	< 0.0001***
Smart phone and Depression	0.2239	< 0.0001***
Stress and Depression	0.6313	< 0.0001***
Stress and Anxiety	0.6539	< 0.0001***
Anxiety and Depression	0.6540	< 0.0001***

R=Pearson's Correlation coefficient, p-value * for p < 0.05, ** for p <0.01, * for p < 0.0001)**

Table 2: Mean between Pre and post-test scores of the participants on Addiction levels

Category	Pre-Test Score	Post-Test Score	Difference p < 0.001
Mean Smartphone Addiction Score	48.2	41.6	-6.6
Percentage of High-Level Addiction	45.8%	38.3%	-7.5%
Percentage of Low-Level Addiction	54.2%	61.7%	+7.5%

DISCUSSION

The study revealed many interesting findings. More than half of the students i.e., 59% of them agreed that they have smartphone addiction symptoms. Males were using it for games joining as groups and females were using it mostly for multimedia applications. Similar to the present study 45.77% of smartphone addiction with the majority of males and addiction is seen in the higher-income group. Ammati R et al, (2018) reported nearly half of the male students and a quarter of the female students were addicted to the smartphone. 51% of male students and 23.5% of female students were addicted. Similarly seen in Sharma et al, males are addicted more than female students. The high prevalence rate in the present study indicates the potential health problem posed by smart phones in college students. Similar findings were noted in a study on psychological risk factors associated with internet and smartphone addiction conducted by Bhatt and Gaur (2019) reported the majority of the students were in the normal range of stress.

About 29% of students fall under severe anxiety levels, and 9% of the students exhibited extremely severe depression. The logistic results showed that smartphone addiction is an independent predictor of stress. The systematic review by Sohn et al (2019) revealed that smartphone addiction is positively correlated with mental health symptoms like depression, anxiety, and perceived stress level was very high among 9359 participants, problematic smartphone use was associated with anxiety with OR = 2.60 and p <.001, and depression category with OR = 3.17 AND P< .001. Out of 5 studies, four studies were found to have a significant association with stress category OR = 1.86, p < .002. In the current study we have not used the criteria with clinical depression and DASS-21 is a self-reported questionnaire mainly designed to measure the emotional state of an individual but not the clinical diagnosis of the depression. The strong correlation between smartphone addiction and the prevalence of depression, anxiety, and stress, which is consistent with the study done by Soni R et al, (2015) revealed the high levels of depression anxiety and stress, with smartphone addiction and significantly higher rates in male (p=0.0004), students than female students. In contradiction to this, a study done by Lemola et al (2014) showed no relationship between smartphone use and depressive symptoms but they concluded these depressive symptoms could be because of sleep related disturbances. However, in tune with our study, the results showed by Hwang et al (2012) depression, anxiety, and stress scores are high in the smartphone overuse group than the normal use group, and also explained about the positive association between the frequencies of using the smart phone directly related to the smartphone overuse. This discrepancy could be because of

cultural and racial differences and Individual perception of the depressive symptoms.

In developing countries like India, adolescents and young adults can face challenging contexts with structural constraints that influence their life experiences, emotions, and satisfaction in life. Majority (54.2%) of the students had the highest possible physical wellness and 45.58% had the lowest possible wellness. This is in concordant with the smartphone addiction scores, the 45.8% were with the high smartphone addiction and 54.2% students with the low smartphone addiction. This shows the higher the smartphone addiction the lower the subjective well being. There is a negative correlation between smartphone addiction and subjective well being(r = -0.17), but statistically significant (p<0.005). This higher percentage of subjective well-being could be, person's inborn temperaments, quality of their relationships, the community they live in, and the ability to meet their needs improves their life' satisfaction, though they are in a high smartphone addiction group. In line with the present study, a cross-sectional study by Suresh P et al (2018) reported 42.7% of students had below-average subjective wellbeing, 41.3% of students had average happiness, and only 16% of the students had above the average subjective well being due to high smartphone addiction. An online study on Malaysian students by Parasuraman et al., (2017) revealed that high Smartphone usage may lead to physiological and psychological complications. They reported that 46.2% of students aware of symptoms of De Quervain syndrome, 53.8% of them with ear discomfort, and 25.9% were having mild to moderate wrist pain. 67.5% of students strongly agreed that they have fatigue, and 57.7% of students strongly agreed that they have sleep disturbances. A study done by Tanita Vaibhav (2020) among students of undergraduate colleges and business schools across India, revealed students with smartphone addiction exhibiting disturbed sleep, tiredness, and neck pain, are having the risk of low subjective well being compared to people who are at safe zone.

An Indian study by Pandya CN et al (2021) revealed a similar significant association with an early onset of smartphone use which was correlated with higher risk of addiction (p< .01), and other predictors of smartphone addiction was, students who used the smartphone for more than 4 hours (p< .001), and spending more than 500 rupees per month (p < .002).

Gideon J.L. et al (2020) in their study found that no gender difference in smartphone addiction, linear relationship between time spent (t = 4.88) on smartphone, students who buy the phone of their choice (t = 3.12), WhatsApp (t = 2.84), Internet surfing (t = 2.38), Music and Videos (t = 3.88) Games (t= 3.23), and Phone calls (t= 3.19) are significantly associated with the smartphone addiction. The variation could be due to the difference in the sample size between the studies. In

present study the Logistic regressions examined the associations between demographics and flourishing scale (subjective wellbeing), the following variables were significant: mother's education (reference category: illiterate; higher secondary education: OR = 0.28. p = .01); Number of times they check the phone in a day: (reference category: once a day; 6-10 times in a day: OR= 0.21, p =.01). Amount of recharge per month: (reference category: 100-200 rupees per month; > 500 rupees per month: OR=0.38, p =. 04). Perception of ill health due to the smartphone (reference category: no perceived ill-health; Headache: OR= 2.46, p = .01). Similar to the present study findings Haug et al (2015), Lin et al (2014), and Hwang et al (2012), these studies explained about headache, hand/ wrist pain, disturbed sleep, fatigue/ tiredness, neck pain is significantly associated with the subjective wellbeing.

In the present study, compared to males, female students reported -1.12 times lesser anxiety, students whose fathers had primary education are 1.88 times more anxious than compared to illiterate. Illiterate parents may not question the usage of smartphones to their children where the anxiety level is less but it can cause addictive behaviours. People who recharge more than 500 rupees reported higher anxiety scores than people who recharge 100-200 rupees per month. People who stay with friends reported 10.16 times higher anxiety than people who live in the hostel. The people with eye strain, neck pain reported 2.47 and 1.46 times respectively more anxiety, compared to people with no ill health. Results showed that age, religion, type of family, the income of the family, number of times they check, and number of hours they use the smartphone were not significant predictors of smartphone addiction ($p > 0.05$). The significant predictors of depression for the students in the study were living with their family (β= 4.95, p=0.03) and with their friends (β =14, p<0.0001) and their perception of ill health with Eyestrain (β = 2.26, p= 0.00), and disturbed sleep (β= 1.84, p= 0.03). The present study measured only the emotional symptoms of depression but not the clinical diagnosis of the depression.

The rTMS therapy results exhibited significant Improvement in the psychological outcomes of the participants. the participants displayed high levels of anxiety, depression, and smartphone addiction pre-intervention with a few also reporting issues such as physical discomfort and sleep disturbances. The Pre-intervention scores for depression (Mean= 17.6, SD = 3.8) and anxiety (Mean = 18.4, SD = 4.2) were noticeably high, showing significant emotional distress. After finishing the rTMS therapy, a significant reduction in levels of anxiety and depression. The post-intervention scores exhibited a reduction in depression (Mean = 10.3, SD = 2.9) and anxiety (Mean = 12.2, SD = 3.5) exhibiting an improvement of approximately 41% and 33%, respectively. Moreover, participants reported a reduction in physical symptoms such as neck pain, and eye strain which are often closely linked with excessive smartphone usage. Post the intervention it has been revealed a significant improvement in subjective well-being overall, with many participants reporting improved coping mechanisms and emotional regulation which in turn improves their subjective well-being scores (Mean = 47.3, SD = 6.7) compared to pre-intervention scores (Mean = 41.2, SD = 7.3).

The findings around previous studies on the effectiveness of rTMS in treating mood disorders and anxiety, as seen in the works of Loo et al. (2018) and George et.al (2017) who mentioned that rTMS can reduce the symptoms of depression and anxiety are noted to be consistent. In the current study, rTMS targeted areas of the brain associated with addiction and mood regulation, contributing to the improvements observed, which also aligns with the research available that suggests modulating brain activity with the help of rTMS therapy specifically in regions like the prefrontal cortex often implicated in Addictions and mental health conditions. Additionally, neural plasticity might be facilitated with the help of rTMS in reducing the inclination towards engaging in addictive behaviours such as excessive usage of smartphone and emotional regulation. The alleviation of symptoms related to smartphone addiction noticed in the post-intervention assessment score indicates the changes in brain's reward systems, which play a crucial role in addiction-inclined behaviours. Further studies with bigger sample sizes and long-term follow-up time would help explore the long-term effects in rTMS context

CONCLUSION

The findings from the present study suggest that rTMS intervention has a significant effect on smartphone addiction and psychological well-being as well as subjective well-being among college students. There was a significant association between rTMS intervention and smartphone addiction, psychological well-being, as well as subjective well-being with the selected demographic variables. This calls for strategies and initiatives to address these emerging behavioral addictions with advanced intervention techniques and improve the mental health of future doctors.

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