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# Effect of mobile phone dependence on various aspects of academic achievement: evidence from Chinese and Czech university students

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## Abstract

Mobile phone dependence refers to the excessive use of mobile phones by individuals, which may cause problems in study, work and life. We compared differences in mobile phone dependence among Chinese and Czech university students, and explore the relationship between mobile phone dependence and academic achievement among them in this paper. The subjects of this study included 358 Chinese university students and 282 Czech university students who was recruited during March to April 2022. We collected data through online questionnaires, using the Short Version of the Smartphone Dependence Scale (SAS-SV) to assess the level of students' mobile phone dependence and the Academic Achievement Questionnaire (AAQ) to assess the level of students' academic achievement. The results show that for the level of mobile phone dependence are negatively correlated with the scores of various dimensions of academic achievement and the total score of academic achievement, among them, Chinese students have more significant effect in the relationship between mobile phone dependence and study performance, moreover, the correlations between the three sub-factors of academic achievement in Chinese students were stronger. It can be concluded that mobile phone dependence may lead to lower study performance, more difficulty in handling study demands, and lower social adaptation, or lower academic achievement may also lead to more severe mobile phone dependence.

**Keywords:** Mobile phone dependence, Academic achievement, University students.

## Introduction

With the advent of the digital age in the 21st century, mobile phones have gradually become an indispensable object in people's lives. In 2017, according to the International Telecommunication Union, mobile phone users worldwide already account for three quarters of the world's population, and at the end of 2018, 51.2% of individuals (3.9 billion) used the internet In addition, in 2019, the global epidemic of Covid-19 entered the situation, and in this context, mobile phones have become one of the main tools for communication, work and entertainment. In this way, the isolation of individual people has deepened and the level of use and potential dependence on digital technologies has deepened (Li, Zhan, Zhou, & Gao, 2021; Volpe et al., 2022; X. Yang, Yip, Lee, Zhang, & Wong, 2021). Although mobile phones have brought a lot of convenience to people's lives, excessive use of mobile phones has also become a problem in today's society. There is a saying among adults that "the furthest distance is not between life and death, but when we sit together and just play with our own mobile phones". This flirtation fully reflects the helplessness of people addicted to mobile phone use. This phenomenon is known as mobile phone dependence. University students are the typical victims of mobile phones dependence. They have strong learning ability and can adapt to new things (including mobile phones) more quickly, which also brings dependence. In 2018, in a survey of mobile phone use among 865 Chinese university students, 41.94% of respondents said that they used mobile phones for 4–6 hours a day, among which listening to music, social software and online use was the most frequent. More than 70% of students said that the lack of a mobile phone network affected their quality of life (Mo et al., 2018).

Excessive use of mobile phones is usually not without consequences, which in many cases are negative in nature. There are many studies showing that mobile phone dependence could cause many problems. From a psychological point of view, many studies have explored that individuals experience more depression, anxiety and stress as the frequency of mobile phone use increases (Choksi & Patel, 2021; Gao, Li, Han, Gao, & Mei, 2017; Han, Geng, Jou, Gao, & Yang, 2017) and even increase the risk of suicide (P.-W. Wang et al., 2014).

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In terms of social integration, individual mobile phone dependence may affect interpersonal relationships. For example, university students' mobile phone dependence may have a negative impact on their parents, friends and close relationships (Krasnova, Abramova, Notter, & Baumann, 2016; Roberts & David, 2016; Sun et al., 2020; X. Wang, Xie, Wang, Wang, & Lei, 2017). Academically, students overuse mobile phones, use their phones during study time and they may find it difficult to escape from mobile games, social software and online shopping. This creates the possibility of academic procrastination (Pamuk, Erdoğan, Eren-Yürük, & Pamuk, 2013; Z. Yang, Asbury, & Griffiths, 2019), sometimes there may be a direct impact on academic performance (Tian et al., 2021). From the perspective of physical health, blue light from mobile phones may hinder students' sleep at night, thereby reducing sleep quality (Ibrahim et al., 2018; Jniene et al., 2019) and seriously affecting vision (Lawrenson, Hull, & Downie, 2017). In addition, the dependence of university students on mobile phones is also influenced by the cultural environment, not only within individual countries, but above all on a global scale (Peraman & Parasuraman, 2016). A number of studies suggest that the Chinese population has a higher rate of dependence on mobile phones compared with European countries (such as Germany and France)(Liu et al., 2017; Olson et al., 2022).

In the academic environment, students' academic achievement is crucial. It plays the key role in the learning process and is one of the most important results of the educational process, while also pointing out the effectiveness and quality of the educational institution. In most cultures, it is also one of the main goals that society expects from every individual. Academic achievement is a mechanism that informs students about their talent, abilities, knowledge acquired in various scientific disciplines and competencies necessary for the development of their future careers. In this context, the most important indicators are marks, results of exams or special knowledge tests, study percentile, etc. Other important aspects of study achievement also include the knowledge of the organizational environment, study effectiveness, self-control or the ability of time management (Illahi & Khandai, 2015; L. Křeménková & J. S. Novotný, 2020; Tezer, Özden, & Elci, 2016; Erdemir & Tomar, 2019) Academic achievement also has a certain impact on the future of students. Among them, higher academic achievement may mean better job performance, higher income, and better labour market competitiveness in the future, whereas low academic achievement may lead to poorer job performance and lower income, that is, weaker labour market competitiveness (Reardon, 2013). Additionally some studies have found that this effect is transnational (Chmielewski & Reardon, 2016). At the same time, academic success also contributes to the formation of students' self-confidence, where good study results lead to the strengthening of self-confidence and vice versa(Alves-Martins, Peixoto, Gouveia-Pereira, Amaral, & Pedro, 2002; Srivastava, 2013; Cantekin, Ö. F., 2020).

To sum up, there have been many studies on the harm of mobile phone dependence. However, in these studies, researchers mostly analysed the relationship between mobile phone dependence and sleep quality, academic procrastination and academic performance to reflect the possible impact of mobile phone dependence on academic achievement. Not so many studies delved into the effects of mobile phone dependence on various aspects of academic achievement and there are only few comparative studies on the level of mobile phone dependence and its impact on academic achievement in different cultural backgrounds.

## Method

### Research Design

The research model has been conducted as a quantitative study. The aim of this study was to examine effect of mobile phone dependence on various aspects of academic achievement in two different cultural settings and to compare them against each other.

### Sample

Through online questionnaires, two groups of university students were recruited; 282 Czech students (mean age ±SD = 25.1±7.5, 87.6% female) from the Faculty of Education, Palacký University via their official university emails and 358 Chinese students (mean age ±SD = 21.6±2.0, 68.2% female) from the Faculty of Educational Sciences, Chongqing Normal University in Sichuan province via Wechat social app.

### Data Collection Tools

Mobile phone dependence was measured using the Short Version of the Smartphone Addiction Scale (SAS-SV) (Kwon, 2013).The scale consists of 10 items rated on a six-point scale (1 = totally disagree, 6 = totally agree), with higher scores indicating a higher level of mobile phone addiction. The Cronbach's α was 0.76.

Academic Achievement was measured using the Academic Achievement Questionnaire (AAQ)(L. Křeménková & J. Novotný, 2020).This is an 9-item questionnaire designed to measure academic achievement. The questionnaire includes three subscales: study performance, handling study demands and social adaptation. The items are rated on 6-point Likert scale. The first subscale is calculated as a weighted mean of ECTS grades, while the remaining subscales are calculated as mean response values. The reliability of the questionnaire subscales equals ω = .801, .810, and .638.

### Data Collection

Data were collected through an online questionnaire (Google Forms in the Czech Republic and Wenjuanxing in China) in two identical forms in Czech and Chinese. Data collection was conducted from February to April 2022.

The authors declare that all of the procedures included in this work are in accordance with the ethical standards of the relevant national and institutional human experimentation committees and with the Helsinki Declaration of 1975, revised in 2008. All participants were informed of the confidentiality of their responses and signed an online informed consent form before completing the questionnaire. No specific information allowing the identification of specific students (e.g., IP address, student name or ID number, specific field of study, etc.) was collected as part of the online data collection.

**Data Analysis**

No missing values were detected. Due to the non-normal data distribution, all variables were standardized to Z-scores prior to the analyses. Associations between the variables were first analysed using Pearson's correlation, while differences between the correlation coefficients were analysed by the Z-test with Fisher's r-to-z transformation. The effect of mobile phone dependence on each of the scales of academic achievement was analysed using a series of linear regression analyses. Differences between the regression models in the context of students' country of origin were tested using the Z-test (assuming equality of regression coefficients ) and using an interaction term in the moderation analysis (Country*mobile phone dependence). Data analyses and visualizations were performed using RStudio (v. 1.4.1717 with R environment v. 4.1.3) using cocor, dplyr, GGally, ggplot2 and stats packages.

## Findings

The initial analysis showed significant correlations between both variables across the dataset and within both countries (Figure 1), with effect sizes ranging from small to very large. Further examination showed that the correlations between mobile phone dependence and academic achievement scales (the aim of this study) were significantly different in all of the cases (with $p<0.0001$). Furthermore, significant inter-country differences in mobile phone dependence were observed ($t(497.67)=12.483$, $p<0.001$) with higher levels in Chinese students.

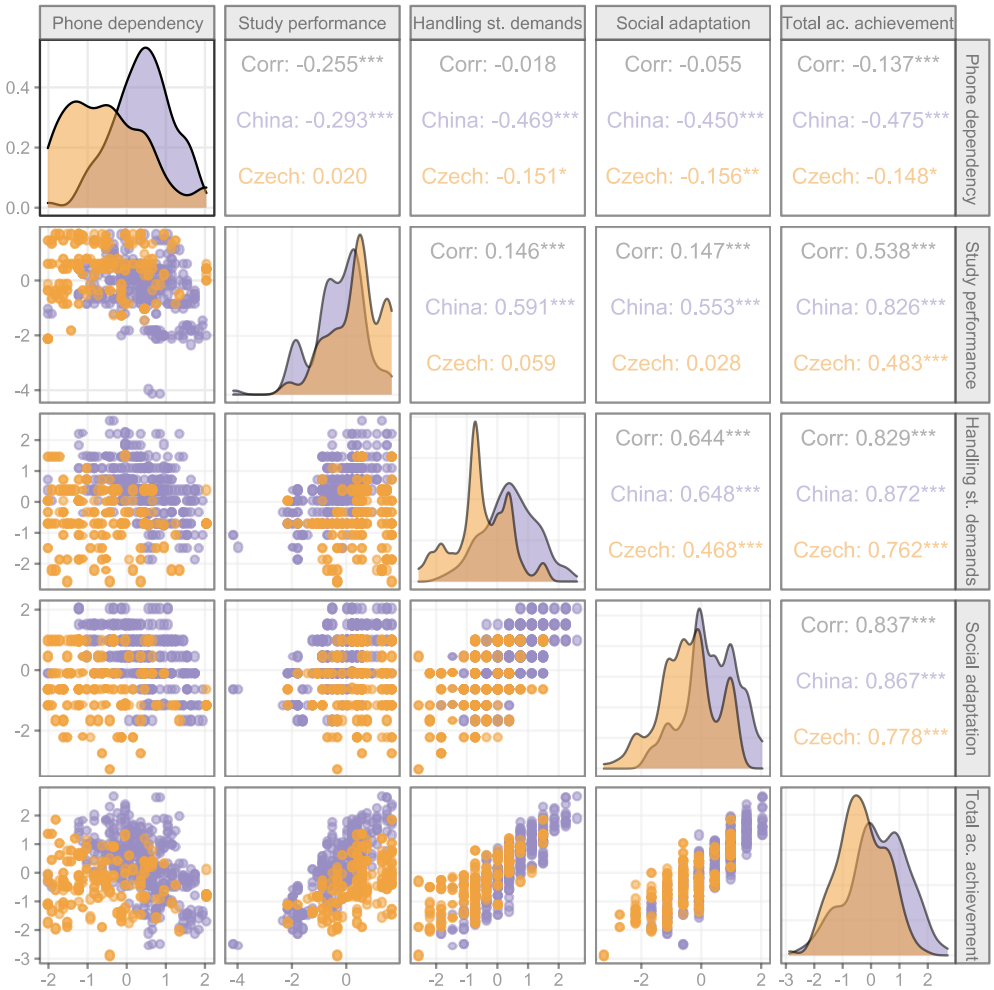


**Figure 1**: Correlation matrix showing a density plot of the z-scores of each variable, scatterplot of the distribution of values in both countries and strength of the correlations between the variables. *p<0.05, **p<0.01, ***p<0.001.

Next, it was examined separately for both groups of students whether mobile phone dependence affected different aspects of academic achievement. Regression analyses (Table 1) showed that for Chinese students, increasing levels of mobile phone dependence significantly translated into poorer academic achievement in all of its domains. In contrast, for Czech students, the effect of mobile phone dependence appeared to be weaker but was again significant for all of the domains of academic achievement except direct study performance, again with a negative effect.

**Table 1**: Effect of mobile phone dependence on academic achievement scales based on students' country of origin (regression analysis)

| DV | Country | β [95% CI] | SE | t | P | adj. $R^2$ |
|---|---|---|---|---|---|---|
| Study performance | China | -0.371 [-0.497, -0.244] | 0.064 | -5.779 | <0.001 | 0.083 |
| | Czech | 0.018 [-0.089, 0.124] | 0.054 | 0.329 | 0.743 | <0.001 |
| Handling study demands | China | -0.538 [-0.497, -0.244] | 0.054 | -10.013 | <0.001 | 0.218 |
| | Czech | -0.131 [-0.089, 0.124] | 0.051 | -2.559 | 0.011 | 0.019 |
| Social adaptation | China | -0.528 [-0.497, -0.244] | 0.056 | -9.495 | <0.001 | 0.199 |
| | Czech | -0.143 [-0.089, 0.124] | 0.054 | -2.637 | 0.009 | 0.021 |
| Total score | China | -0.65 [-0.497, -0.244] | 0.064 | -10.178 | <0.001 | 0.223 |
| | Czech | -0.122 [-0.089, 0.124] | 0.049 | -2.511 | 0.013 | 0.013 |

Finally, it was examined whether the observed effect of mobile phone dependence on academic achievement varied depending on students' country of origin. The results of the Z-test and moderation analysis confirmed the assumption based on previous findings that mobile phone dependence negatively affected academic achievement especially among Chinese university students, as there were significant inter-country differences in all of the domains of academic achievement (Figure 2, Table 2).

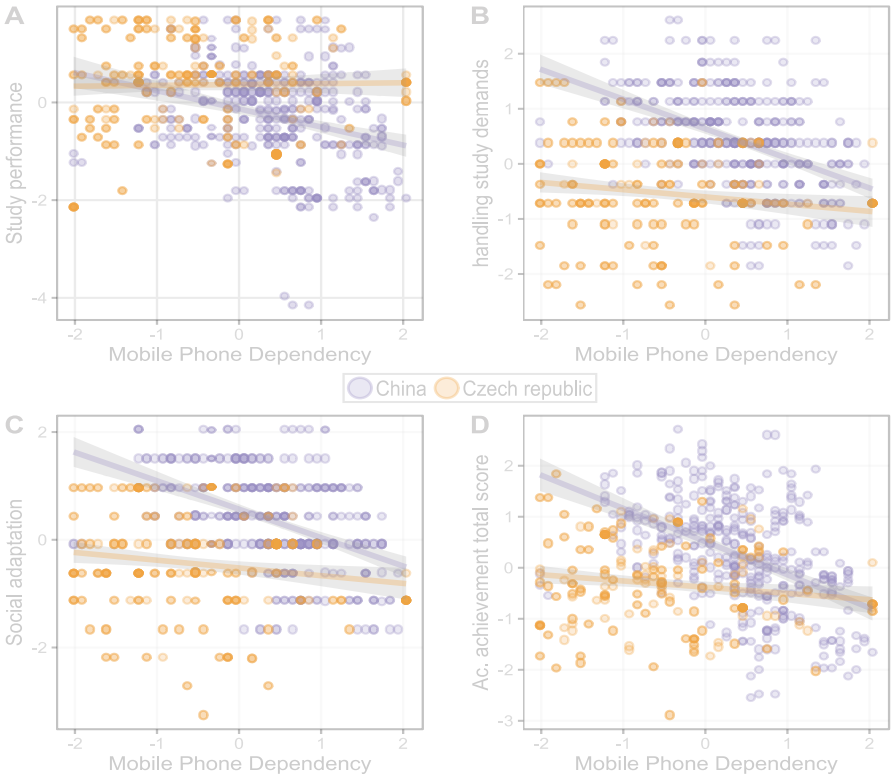


**Figure 2**: The interaction effect of students' country of origin and mobile phone dependence on academic achievement. Scatterplots with regression lines for the two groups of students show the effect on (A) academic performance, (B) coping, (C) social adjustment and (D) overall academic achievement (values shown as Z-–scores).

**Table 2**: Comparison of regression coefficients of the effect of mobile phone dependence on academic achievement between Chinese and Czech students

| | Z-test | | Moderating effect (country*mpd) | | | |
|---|---|---|---|---|---|---|
| | Z | p | β [95% CI] | SE | t | p |
| Study performance | -4.629 | <0.001 | 0.388 [0.223, 0.553] | 0.084 | 4.625 | <0.001 |
| Handling study demands | -5.478 | <0.001 | 0.407 [0.223, 0.553] | 0.075 | 5.449 | <0.001 |
| Social adaptation | -4.944 | <0.001 | 0.384 [0.223, 0.553] | 0.078 | 4.912 | <0.001 |
| Total score | -6.57 | <0.001 | 0.528 [0.223, 0.553] | 0.08 | 6.588 | <0.001 |

mpd=mobile phone dependence

## Discussion

The aim of this study was to identify the correlations between mobile phone addiction and academic achievement. It turned out that a higher mobile phone addiction led to worse academic achievement. These conclusions are consistent with a number of other studies (Arefin, Islam, Mustafi, Afrin, & Islam, 2017; Raza, Yousufi, Rafi, & Javaid, 2020; Sunday, Adesope, & Maarhuis, 2021; Tian et al., 2021).

A more detailed analysis of the results shows that mobile phone addiction has a significant negative effect especially on the academic achievement scales "handling with study demands" and "social adaptation". These findings seem to be logical. The more time students spend on a mobile phone, the less space and perhaps also willingness they have for real social interactions and preparation for exams, writing seminar papers, etc. Generally, mobile phone addiction distracts individuals from their normal life and most of the activities that are part of it (García-Santillán & Espinosa-Ramos, 2021). To meet their study demands, students need a certain amount of self-control and time management skills. Many studies have found that mobile phone dependence is often negatively correlated with students' self-control, which means that students with poor self-control may be more likely to uncontrollably prolong mobile phone use and have difficulty in handling study demands. In addition, a higher level of mobile phone dependence may further impair students' self-control (Han et al., 2017; Jiang & Zhao, 2016; G. Yang, Tan, Li, Liu, & Wang, 2019). In addition to the above, mobile phone dependence could cause academic procrastination and academic life satisfaction (Balkis, 2013) but it could also cause academic burnout (Hosseinpour, Asgari, & Ayati, 2016). All of the factors above may hinder students from handling their study demands. Also, students who have difficulty handling study demands are likely to use mobile phones more. In the context of social adaptation, previous research findings (e.g., Herrero, Urueña, Torres, & Hidalgo, 2019) found out that mobile phone dependence was likely to decrease students' social support levels, while lower social support increased the risk of mobile phone dependence. This may be due to the fact that students spend too much time on their mobile phones, reducing opportunities to build relationships with teachers and classmates. At the same time, as mentioned above, mobile phone dependence may have a negative impact on self-control, and it may also be more difficult for students to learn to self-study and self-planning. Naturally, mutual relationships are affected by a number of other variables which may moderate the identified correlation in different ways. However, these variables were not analysed in the present study.

Looking at the correlation between mobile phone addiction and study performance, a significant correlation was observed only on the part of Chinese students. It could be speculated that this factor was affected by the generally higher mobile phone addiction among Chinese students as opposed to Czech students. It is therefore possible that only a higher degree of mobile phone addiction affects study achievement. At the same time, the different results may also be related to different preparation styles, teaching styles as well as the methods of assessment of study performance in the two countries. According to some studies, Chinese students show lower openness, conscientiousness and agreeableness compared with European students as a result of their cultural background (Reese et al., 2014). This seems to make the learning style of Chinese students very monolithic including step-by-step learning and memorization with the absence of diverse learning styles. Previous research concluded that individuals with a higher degree of openness more often adopted learning styles such as elaboration, processing and synthesis-analysis (Komarraju, Karau, Schmeck, & Avdic, 2011). The higher degree of mobile phone addiction and not so effective learning strategies confirm a negative correlation between mobile phone addiction and worse study performance among Chinese students.

Chinese students show a generally higher degree of mobile phone addiction compared with Czech students. This difference in mobile phone addiction may result from the different lifestyles of university students in the two countries and their cultural differences. Compared with Chinese university students, Czech university students can pursue more healthy activities in their free time, such as frequent camping, hiking and sport, while Chinese university students currently prefer to follow social networks and play mobile phone games with their friends. Compared with China, the Czech Republic is a small country geographically and the distances between people are much smaller. For Czech students, it is usually easy to spend time with their friends and family despite studying in another city or a different part of the country. In China, regarding the considerable distances between regions, this is usually not possible. In many cases, Chinese students may resort to the online environment to decrease their social isolation, reduce stress and fill their free time. In addition, it is typical in the Czech Republic that people spend time in cafés, restaurants or pubs, meet their friends and play various games in the real environment. In China, on the other hand, there is a new phenomenon: students meet their new classmates or friends to play online games on mobile phones. Those who are reluctant to do so are forced by peer pressure (Han and Qi, 2005). Last but not least, the COVID-19 pandemic needs to be taken into account as it caused large-scale lockdowns in both countries and with a high degree of probability played a significant role in terms of mobile phone addiction (e.g., Zhan, Wei, & Hong, 2021). However, regarding the fact that the restrictions were similar in the two countries in terms of duration and extent, this impact was probably on an individual level.

## Conclusion

Digital technology (including mobile technology) brings a wide number of possibilities, reliefs and challenges to all areas of human life. For the generation of young adults, it is probably not difficult to technically and cognitively control these technologies but, on the other hand, their rapid development does not seem to have enabled adequate adaptation in terms of emotional and social aspects. This results in an increasing number of cases of addiction to this technology, especially mobile phone addiction, which brings a variety of negative effects. In the area of education, this mainly affects worsening academic achievement among university students. The strength of this study is the confirmation of these correlations in the

context of an intercultural comparison and taking into account the detailed inclusion of the components of academic achievement.

## Suggestion

This study suggests several recommendations for practice. First of all, it should be understood that mobile phone addiction is a reality and a fact for a large number of students. In this context, it is of critical importance to reveal the causes and dynamics of this addiction in cooperation with, for example, university psychological and counselling centres. Students should also be provided with a sufficient number of attractive free time alternatives that support peer contact. This could also be facilitated by the academic environment, which has the potential to organize a number of official as well as unofficial events. These events may include adaptation courses (mostly at the beginning of the first year), canoeing, mountaineering or other sports courses, activities that match students' specializations, summer courses and summer schools, student events (May celebration, concerts, initiation parties) and a number of others.

## Limitation

The results of the study must be interpreted in the context of several limitations. First of all, the sample is not balanced in terms of gender with a predominance of women. This is due to the fact that faculties of education are attended mostly by women regardless of country. This is related to another limitation of the study. The sample is composed of teacher training students, which to some extent limits the applicability of the results to a wider group of university students. Moreover, the cross-sectional design of the study does not allow a direct assessment of the causality between the variables. To further confirm the findings, follow-up studies should be performed with equal gender representation, a more diverse sample and, if possible, a longitudinal design. The pandemic is likely to have played a significant role in the degree of the use of mobile technology as well as the methods of teaching in universities and study performance. It is therefore desirable to verify the general and long-term validity of the results in stable non-pandemic conditions.

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