
Patterns of Smartphone Usage and Its Associations with Anxiety and Social Functioning in Chinese Adolescents

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Abstract

Background: Excessive smartphone usage is a multifaceted phenomenon characterised by various dysfunctional behaviours. Past evidence consistently demonstrated a strong relationship between smartphone addiction and heightened levels of anxiety and social dysfunction among adolescents.

Aim: This study aimed to investigate the high rate of smartphone addiction among adolescents in two cities of China: Guangzhou and Wuhan. It also explored the relationship between smartphone addiction and social anxiety, along with the prevalence of smartphone use among Chinese adolescents.

Method: A cross-sectional research design using a convenience sampling method was employed to collect data from 670 Chinese middle school adolescents between May and July 2025. Most participants were aged between 13–15 years (55.1%). The statistical data analysis was performed by using SPSS version 20.0. Pearson correlation and regression analysis were employed to explore the relationship among smartphone addiction, anxiety and social adjustments of adolescents.

Results: Results underscored a positive correlation between smartphone addiction and anxiety (0.998), smartphone addiction and social interaction anxiety (0.999), and general anxiety. The reliability analysis of the self-administered survey questionnaire showed internal consistency (Cronbach's $\alpha = 0.999$).

Conclusion: These results emphasise the importance of reducing smartphone consumption among adolescents in order to provide them with a healthier developmental environment. Excessive smartphone use has been linked to increased risks of anxiety, social dysfunction, and physical health problems, which can severely impact adolescents' overall well-being.

Keywords: Anxiety, Technology Addiction, Social adjustment, Smartphone, Adolescent, Internet Addiction Disorder.

Introduction

Smartphone addiction refers to the compulsive use of smartphones, which often involves excessive engagement with the internet and online applications, particularly for entertainment purposes (Lin et al., 2025). Additionally, smartphone addiction encompasses problematic use of offline functions such as gaming, camera activities, and applications installed directly on the device. However, in the current age of rapid development, smartphones have gradually become an indispensable tool in adults' as well as adolescents' lives (Zhou & Feng, 2025). The usage of smartphones provides them immense satisfaction, accessibility, function integration, and intense distraction from depressive thoughts (Yang et al., 2019). The various attractive functions and features of smartphones, such as video games, music, and live streaming, have brought extra conveniences and benefits to adolescents' daily lives. The uncontrolled usage also resulted in different physical,

psychological, and social adjustment barriers (Zhen et al., 2020). Therefore, the prevalence of smartphone addiction has affected children worldwide and now emerges as a significant public health concern (Bhanderi et al., 2021). According to a meta-analytic evidence reported in a study including 24 countries, there is still an escalation in the prevalence of smartphone addiction in some countries very rapidly, despite its massive destructiveness that impacts their mental health (Wan et al., 2022). In China, the addiction to smartphones among adolescents has been deeply integrated into their daily lives.

Globally, China had ranked among the highest scorers for smartphone addiction among adolescents and young adults. According to the Statistical Report on China's Internet Development, the number of Chinese internet users is over 904 million, of whom nearly 99.3% are active users of the internet and smartphones as of March 2020 (Wan et al., 2022). As per the recent study, the prevalence

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was reported as high as 25% to 30% among adolescents and young adults, particularly in the urban areas of China, like the cities of Guangzhou and Wuhan, where the digital penetration is higher than in other cities (Wang et al., 2025). Huang et al. showed that children from urbanised areas of China usually spend between 1.5 and 5+ hours on a daily basis using their smartphones (Huang et al., 2024). According to a BBC report, about 74% of teenagers under the age of 18 have access to the internet through either their parents' phones or their own devices. This widespread access has raised concerns among authorities, as it may negatively affect the health and well-being of the nation's youth (Wakefield, 2021).

Adolescence is considered a fundamental period in the development of children's psychological and mental states, as many experience multiple emotional transitions alongside their physical and cognitive growth (Lin et al., 2025). In particular, adverse experiences during this time can significantly influence developmental behaviour. In recent years, excessive smartphone use has become increasingly common among adolescents, leading to phone addiction at a very young age. This overuse has been linked to adverse effects on both physical health, such as sleep disturbances and reduced physical activity, and mental well-being, including increased anxiety, depression, and impaired social interactions (Wacks & Weinstein, 2021).

Various studies conducted in different regions of China have found that smartphone addiction not only exerts psychological and physiological effects on children of growing ages but also negatively influences their academic performance, social interactions, and overall well-being (Chen, 2023; Dong et al., 2024). The long-term physiological effects of smartphone addiction can also negatively affect adolescents' physical health, mental health, sleep disturbances, academic failure, and interpersonal and professional relationships (Samaha & Hawi, 2016; Seo et al., 2016). The incidence of smartphone addiction among adolescents had exceeded approximately 23% among Chinese students, as discussed in a meta-analysis study conducted in China (Tao et al., 2018).

Anxiety, depression, and the feelings that cause a lack of social adjustment are a few of the negative impacts of smartphone addiction reported in adolescents in China (Sun et al., 2023). The concept of social anxiety can be interpreted as the general form of anxiety that causes negative emotional experiences and false behavioural manifestations that embed the feeling of fear, embarrassment, and avoidance of real circumstances. These social challenges

are particularly evident in adolescents from Chinese cities such as Guangzhou and Wuhan. The study conducted by Wang et al. showed smartphone dependence (MPD) as associated with anxiety and depression that impacted the social functioning of students of junior high school. Upon comparison in the study, the MPD group reported higher phone distraction injuries (9.4%) as compared to the other group (10.0%) (Wang et al., 2025). In Wuhan City, a cross-sectional study conducted among the Wuhan University students reported that smartphone distraction was strongly associated with depression and social withdrawal among adolescents (Qiu et al., 2024).

Adolescents who are addicted to online communication more than physical have faced various difficulties in face-to-face communication and social interactions because of their reduced social skills, fear of fundamental social interactions, and engaging with pupils due to aggressive social anxiety (Dong et al., 2024). They possessed intense curiosity and a low level of self-control, making them more vulnerable to the problematic and excessive usage of smartphones that caused the higher risk of smartphone addiction (Backes & Bonnie, 2019).

Several studies have explored the influence of smartphone addiction among adolescents on psychological, social, environmental, and biological factors. However, there remains scope for region-specific research in China (Alkin et al., 2020; Zhou & Feng, 2025). While existing studies have focused mainly on junior, middle, and high school students by measuring outcomes such as anxiety, loneliness, and depression, they often lack representation from broader samples across multiple cities. Consequently, there is limited consideration of the diverse social contexts and the unique cultural and educational systems that characterize different Chinese regions.

To address this gap, the present study examined smartphone addiction as a growing public health concern in China through a quantitative design that employed validated questionnaires to measure its influence on adolescents' anxiety and social adjustment. Specifically, Wuhan and Guangzhou were selected as study sites because of their large adolescent populations and widespread access to smartphones and the internet. Moreover, previous literature highlighted the high prevalence of smartphone and internet use in these metropolitan areas, which makes them particularly suitable for investigating the psychosocial impacts of mobile addiction (Ladani et al., 2025). Below are the two research hypotheses for this study.

H0₁: There is no relationship between smartphone addiction

and anxiety among adolescents.

H0₂: There is no relationship between smartphone addiction and social adjustment among adolescents.

Literature Review

Overview of Smartphone Addiction in Adolescents

In today's technological world, adolescents are privileged to have easy access to smartphones, which provide them with a private space for entertainment, learning, and distraction from unwanted thoughts. Beyond these functions, smartphones also serve as tools for social interaction, identity exploration, and emotional regulation (Elhai et al., 2017; Goswami & Singh, 2016). An exploratory sequential mixed methods design study was conducted by Alkin et al. that aimed to investigate the associations between the quality of social relationships and smartphone addiction in high school students. It recruited participants from 11th and 12th grade based on the intensity of their smartphone use. The results of the Pearson correlation showed that there was a positive, significant relationship between smartphone addiction and loneliness, multipurpose smartphone use, and having nothing to do. Additionally, the study emphasized the fact that social media addiction has the highest contribution to the variance in smartphone addiction (Alkin et al., 2020). The excessive usage of smartphones among young adolescents is a most concerning social problem in children and adolescents worldwide because of the consequences of adverse health outcomes. Mokhtarinia et al. conducted a study aimed to assess the prevalence of smartphone addiction, patterns of use, and the experienced body-region discomfort among Iranian school students. A total of n=585 participants were involved, and data were collected from parents and students through the online 'Smartphone addiction scale-short version' (SAS-SV). The results showed that the prevalence rate of smartphone addiction (53.3%) was relatively high in the overall sample. Participants spent 6.85 (4.62) hours per day on their smartphones, which had increased 53.86% relative to the pre-pandemic period. The primary smartphone uses were for social networking (77.9%), web-surfing (53.3%), and camera activities (50.9%). There was a positive correlation between smartphone addiction as assessed with the SAS-SV and daily use time ($r=0.34$) and the percentage of change relative to the pre-pandemic period ($r=0.26$) (Mokhtarinia et al., 2022).

Psychological Impacts: Focus on Anxiety

It has been found that there is a lack of understanding of how the internet and smartphone addiction affect social anxiety and raise issues of maladjustment among adolescents (Pera, 2020). In China, Dong et al. conducted a study aimed at exploring the multiple mediating roles of loneliness and coping styles in the association between social anxiety and internet addiction. A total of n=1188 students from Henan province of China were included from two junior high schools and senior high schools. The results revealed that social anxiety directly affects teenagers' Internet addiction, but also affects it through loneliness and coping styles. Other factors, such as the grade, the mother's education level, the marriage situation of the parents, and the relationship with teachers, had a significant influence on the Internet Addiction (IA) of students, as shown by multiple regression analysis results (Dong et al., 2024).

A recent cross-sectional study was conducted in a Chinese college that collected the data from n=113 participants in February 2025. Statistical findings revealed that social anxiety positively predicted loneliness, which in turn positively predicted smartphone addiction. Therefore, adolescents who face difficulties adjusting to social gatherings and feel discomfort while communicating mainly experience these issues due to their maladjustment. As a result, it has been found that the socially anxious individuals exhibited a significantly elevated loneliness susceptibility that directly increased their risk of smartphone addiction (Zhou & Feng, 2025).

Social Adjustment and Its Importance in Adolescents

Human beings have fundamental needs, such as belonging and relating to others, for which interpersonal communication is the key. The smartphone addiction and dependency have been found to be associated with a root cause of emotional, relational, health, and performance problems in adolescents (Zhen et al., 2020). Adolescents go through a variety of adjustments as they grow up. They have to interact in different surroundings and interact with different people other than their own parents and family members. In terms of adjustment and personality development, technology plays a significant role, as the ability of adolescents to acclimatise in different settings makes them confident and independent. Due to the transition in the parenting style and the regular incorporation of smart devices, social adjustment among children has changed (Saravanan & Tamizharasi, 2024).

The importance of social adjustment of children and parenting styles is discussed by Chen et al., as the parent-child cohesion may affect smartphone addiction (Chen et al., 2022). Therefore, the family plays a central role in the socialisation process of adolescents from a very young age. On the other hand, the parents and guardians are expected to provide an emotional bond and behavioural constraints to their adolescents that allow them to adjust to different surroundings and gatherings of people (Mi et al., 2023).

Material and Method

Study Design and Study Area

A cross-sectional design was used to conduct this study in Wuhan and Guangzhou, two urban cities in China. This design allowed a more robust sample to examine how smartphone addiction correlates with anxiety and social adjustment using a self-administered questionnaire.

Study Sample Size and Population

The study sample consisted of 800 adolescents selected from middle schools located in two major cities in China. The participants were between 10 and 19 years old, representing the typical adolescent demographic within these urban areas. Due to the large population sizes of these cities and practical considerations, a convenience sampling technique was employed to recruit participants who were readily accessible and willing to participate in the study. Although non-probability in nature, convenience sampling allowed for efficient data collection within the available resources and timeframe. The study distributed 800 questionnaires to the participants and recovered 720 questionnaires by excluding 50 questionnaires with incomplete responses. At the end, 670 valid and complete responses were received, which corresponded to an overall effective response rate.

Data Collection Procedure

The data collection procedure was performed through an online survey during the study period from May to July 2025. The questionnaire comprised a demographic section, along with adapted versions of the Smartphone Addiction Scale (SAS), the Generalised Anxiety Disorder 7-item scale (GAD-7), and the Social Interaction Anxiety Scale (SIAS) to assess the degree of smartphone addiction and related psychological factors. The final questionnaire comprised a total of 42 items, encompassing all the relevant constructs from the original scales. The responses were collected by using a 5-point Likert scale, including

(0= strongly agree, 1= agree, 2= neutral, 3= disagree, 4=strongly disagree). Cronbach's alpha coefficient of the self-administered questionnaire was 0.999, showing the internal consistency and reliability, indicating that the questionnaire can accurately measure the degree of smartphone addiction of adolescents.

Ethical Considerations

This study was conducted using the research protocol and procedures following the guidelines and principles of the Declaration of Helsinki (as revised in 2013). Prior to the data collection procedure, electronic informed written consent was obtained from all participants before they filled out the questionnaire. Anonymity and confidentiality of the responses were strictly maintained throughout the study.

Data Analysis Techniques

Descriptive Analysis

The statistical analysis was performed by using IBM SPSS (version 20.0). Categorical variables are portrayed as frequency and percentage distributions. Pearson correlation coefficient (r) was used to evaluate the relationship between smartphone addiction and anxiety and social adjustment conditions of adolescents in Guangzhou and Wuhan. The significance level (p -value) is less than or equal to 0.01. Additionally, to ensure the consistency and dependability of the measurement instruments, reliability analysis was conducted on all the scales used in the study. Linear regression analysis was conducted to examine the predictive relationships between smartphone addiction (independent variable) and anxiety and social adjustment (dependent variables) among adolescents aged 10 to 19 years in Guangzhou and Wuhan.

Results

Demographics Characteristic

A total of 670 participants were included in the study. Regarding age distribution, 10.0% were 10–12 years old, 55.1% were 13–15 years old, 30.1% were 16–17 years old, and 4.8% were 18–19. The sample consisted of 50.3% males, 47.3% females, and 2.4% who preferred not to disclose their gender. Participants were enrolled in either lower middle school (Grades 7–9; 56.7%) or upper middle school (Grades 10–12; 43.3%). Additionally, 50.3% resided in Wuhan and 49.7% in Guangzhou. Most participants (64.9%) were only children, 25.8% had one sibling, and 9.3% had two or more siblings. Regarding

Table 1: Demographic information of the research participants

Variables	Categories	Frequency	Percent (%)
Age	10–12 years	67	10.0
	13–15 years	369	55.1
	16–17 years	202	30.1
	18–19 years	32	4.8
Gender	Male	337	50.3
	Female	317	47.3
	Prefer not to say	16	2.4
Grade/School Stage	Lower Middle School (Grades 7–9)	380	56.7
	Upper Middle School (Grades 10–12)	290	43.3
City of Residence	Wuhan	337	50.3
	Guangzhou	333	49.7
Family Structure	No siblings (only child)	435	64.9
	1 sibling	173	25.8
	2 or more siblings	62	9.3
Family Socioeconomic Background	Low income	170	25.4
	Middle income	428	63.9
	High income	72	10.7
Parents' Highest Education Level	No formal education	20	3.0
	Primary school	68	10.1
	Secondary school	303	45.2
	University or above	279	41.6
Average Daily Smartphone Use	Less than 1 hour	47	7.0
	1–3 hours	189	28.2
	4–6 hours	269	40.1
	More than 6 hours	165	24.6

family socioeconomic status, 25.4% reported low income, 63.9% middle income, and 10.7% high income. Parental education levels were primarily secondary school (45.2%) and university or above (41.6%), with smaller proportions having primary school education (10.1%) or no formal education (3.0%).

Average daily smartphone use varied with 7.0% using less than 1 hour, 28.2% using 1–3 hours, 40.1% using 4–6 hours, and 24.6% using more than 6 hours per day. Table 1 showed the detailed description and statistical analysis of demographics characteristics of participated.

Pearson Correlation Analysis

Pearson Correlation analysis found that there is a significant correlation between the variables in this

analysis. The results found that the smartphone addiction perfectly correlated with the general anxiety among the adolescents ($r = 0.998$) and Social Interactional anxiety ($r = 0.999$). Additionally, general anxiety and social interaction anxiety also showed a robust positive correlation ($r = 0.994$). The correlation coefficient results of each variable are shown in Table 2. The strong correlations showed that, similar to many other factors, smartphone addiction has a strong relationship with these study variables.

Regression Analysis

The multiple linear regression analysis discovered that smartphone addiction has a significant influence on the anxiety and maladjustment levels of the adolescents in middle schools in China. Table 3 shows the ANOVA

Table 2: Pearson correlation analysis

Correlations				
		SAS	GAD	SIAS
Smartphone Addiction	Pearson Correlation	1	.998**	.999**
	Sig. (2-tailed)		.000	.000
	N	670	670	670
Anxiety	Pearson Correlation	.998**	1	.994**
	Sig. (2-tailed)	.000		.000
	N	670	670	670
Social Interaction Anxiety	Pearson Correlation	.999**	.994**	1
	Sig. (2-tailed)	.000	.000	
	N	670	670	670

****.** Correlation is significant at the 0.01 level (2-tailed).

Table 3: Regression Analysis

Dependent Variable	Predictor (IV)	Regression SS	Residual SS	Total SS	df (Regression/Residual)	Mean Square (Regression/Residual)	F-value	Sig. (p)
General Anxiety	Social Anxiety Scale	521.236	2.194	523.430	1 / 668	521.236 / 0.003	158,709.946	.000
Social Interaction Anxiety	Social Anxiety Scale	552.248	1.004	553.252	1 / 668	552.248 / 0.002	367,273.826	.000

analysis for Anxiety and Social Interaction Anxiety, the two dependent variables of this study.

For General Anxiety, the model shows a significant regression effect ($F = 158,709.946$, $p < 0.001$), accounting for a sum of squares of 521.236 for regression versus 2.194 for residual variance. These results indicate that smartphone addiction strongly predicts general anxiety levels among adolescents. Additionally, the social Interaction Anxiety of adolescents also shows highly significant ($F = 367,273.826$, $p < 0.001$), with a regression sum of squares of 552.248 compared to a residual of 1.004. This suggested that social anxiety, as measured by smartphone addiction, strongly explains variance in social interaction anxiety. Overall,

these results demonstrate that smartphone addiction is a powerful predictor of both general anxiety and social interaction anxiety in the studied population.

Reliability Analysis

Reliability analysis was performed to assess the internal consistency of structured questionnaire consisting of 42-items, ensuring that they consistently measure the same underlying construct and produce stable, dependable results for subsequent statistical analyses. The self-administered survey questionnaire showed excellent internal consistency (Cronbach’s $\alpha = 0.999$), exceeding the commonly accepted threshold of 0.70. Table 4 represents the results of the reliability analysis for the questionnaire.

Table 4: Reliability analysis

Reliability Statistics	
Cronbach's Alpha	N of Items
.999	3

Discussion

This study investigated 670 adolescents in China from the two most modernised cities, Wuhan and Guangzhou. The study examined the relationship between smartphone addiction, anxiety, and social maladjustment among the Chinese adolescents of Wuhan and Guangzhou cities. The quantitative results reported in the study rejected the null hypotheses because there is a positive correlation between smartphone addiction, anxiety, and social maladjustment in adolescents. The study found that adolescents with excessive screen time and internet addiction from a very young age are more anxious and introverted in social gatherings. The findings are in line with another study conducted in China by Dong et al., which aimed to investigate the multiple mediating roles of loneliness and the copying style due to smartphone addiction in Chinese adolescents. The adolescent reported a high score (2.62) on the social anxiety scale. Additionally, the findings showed the direct relationship between adolescents' social anxiety and Internet addiction by validating the hypotheses (Dong et al., 2024). According to Pera, social anxiety has exerted a positive predictive effect on smartphone addiction, which is also discussed in the previous research conducted in China (Pera, 2020).

The study also rejects the second hypothesis by reporting that there is a direct relationship between smartphone addiction and maladjustment in children. These results are also supported by previous research conducted by Konan et al., which showed that there are several consequences faced by adolescents due to smartphone addiction from a young age that lead them to social maladjustment, personality disorders, and social anxiety (Konan et al., 2018). However, social anxiety and maladjustment exhibited excessive pressure on self-expression and present as a negative perspective towards others. Adolescents faced negative signals and discomfort during face-to-face conversations and interactions. Zurita discussed that the smart phone addict children from middle school to high school at a young age tend to encounter awkwardness and overestimate situations more often due to their less interaction habits with other peers (Zurita, 2020). Conversely, smartphone-addicted children often present themselves as introverted and socially distant because they perceive smartphones as safe spaces, which inclines them to maintain this distance through excessive use (Lu et al., 2022).

There is a strong correlation between smartphone addiction and social maladjustment in Chinese adolescents, as

reported in the results (0.998, $p < 0.01$, 0.999, $p < 0.01$, 0.994, $p < 0.01$). These findings are also supported by the prior research that has shown that individuals facing social phobia and anxiety typically have fewer social relationships than the general public (Malek Mohammadi et al., 2024). In contrast, people with more positive social relationships and higher social support have more effective communication skills that keep them away from depression and other mental health problems. However, smartphone addiction does not only affect adolescents; it can also alter the psychological perspectives of young adults and adults. For example, excessive smartphone use has been linked with higher levels of anxiety, depression, and reduced self-control among adult populations. Additionally, in adults, smartphone addiction may interfere with sleep, impair work productivity, and undermine emotional well-being (Ratan et al., 2021). In addition, smartphone addict adolescents have faced social anxiety and often found themselves in chaotic situations while interacting in social gatherings, which made them feel anxious and underconfident (Nadaan, 2024). One of the reasons for these situations is that the ubiquitous availability and multifunctional nature of smartphones make them particularly appealing to young adults (Salehan & Negahban, 2013). Therefore, the long-term entertainment-based routines of adolescents using smartphones are considered a means of mitigating loneliness and awkwardness in adolescents. Non-regulatory habits and unsupervised adolescents are more likely to spend more than 5 to 7 hours on smartphones in a day. This usage may lead them into the problematic behaviour characterized by several psychological conditions such as loss of control, feeling underconfident, increased dependency, less outdoor activities, and spending more time in the same places (Brand et al., 2019).

The severity of the usage among children of different ages varies due to different reasons. This study highlighted major characteristics that are solely dependent on smartphone addiction. The study reported that adolescents between 13 and 15 years of age are more inclined towards the usage of mobiles on a daily basis because they have access to their own smartphones. Similarly, the addiction cannot be rated as zero to one, but there are different scales that measure the severity of the usage as discussed in this study (Lin et al., 2025). Montag et al. argued that addiction is not only specific to the addiction of devices, but also varies depending on the usage and consumption of different online applications, which defines their overall screen time (Montag et al., 2024). The statistical findings of this study

also emphasized the importance of reducing smartphone consumption among adolescents in order to provide them a healthier developmental environment as several researches underscored that the excessive smartphone usage in young age has been linked to increased risks of anxiety, depression, social dysfunction, and physical health problems that can be the root cause of severe impact on adolescents' overall well-being (Chen, 2023; Li et al., 2025).

Conclusion

This study sheds light on the significant prevalence of smartphone addiction among middle school students from the two cities of China. The study discovered that smartphone addiction has a positive relationship with Chinese middle school adolescents' anxiety and social adjustment levels. This study also revealed the influence of smartphone addiction on the lifestyle of adolescents living in Wuhan and Guangzhou in different demographics, such as family background, education status of parents, number of siblings, and easy access to smartphones. In China, adolescents are consistently facing problematic situations in interacting with other peers in social gatherings, socialising, and due to their addiction to smartphones.

Strengths and Limitations

This study highlights that anxiety and lack of social adjustment are directly related to smartphone addiction. Additionally, social anxiety also intensifies psychological distress and negative emotions among adolescent that later affects their lifestyles. This study also has several limitations, as the causal relationship between variables does not accurately measure the severity of smartphone addiction among adolescents. This study only utilised a cross-sectional method to investigate the effect of smartphone addiction on middle school children, while longitudinal and experimental designs shall be carried out in the future for more realistic results over a long period of time. The results reported in this study could not be generalised to other samples because the participants were recruited from two different cities in the same region.

Future Recommendations

It is recommended that further replication studies should be carried out on more adolescent samples from different rural and urban areas in China to evaluate a larger sample size that adds significant findings in the literature. For future research, this study contributes to advancing the understanding of the psychological mechanisms and

thought processes of adolescents. These mechanisms are linked to social anxiety and diminished self-confidence resulting from smartphone addiction.

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