



## Research article

# Social pressures and their impact on smartphone use stickiness and use habit among adolescents

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## ABSTRACT

Excessive smartphone use has become a growing issue among adolescents as they develop mentally and socially. While researchers have examined individual and technological predictors of smartphone addiction, few studies consider broader societal influences. This study explored how social pressures such as mimicry, coercion, and norms impact persistent conscious smartphone use (use stickiness) and unconscious smartphone use (use habit). A survey was administered in two phases to 309 college students at a university in Southern China to gather data on perceptions of social influences and their degree of smartphone overuse. The relationships were analysed using a structural equation model. The study confirms the impact of three social pressures - mimetic, coercive and normative - on adolescents' degree of smartphone overuse (use stickiness and use habit). The mimetic pressure positively impacted use stickiness but not use habit. The coercive pressure positively impacted both the use stickiness and the use habit. The normative pressure positively impacted use habit but not use stickiness. This study provides a novel perspective on overlooked social drivers of problematic smartphone tendencies among youth. Our study also provides insights for educators, parents, and policymakers to more effectively intervene in adolescent smartphone overuse.

## 1. Introduction

In the era of digital media, modern intelligent terminals such as e-commerce platforms, information-sharing platforms, social platforms, interactive websites, and short video entertainment platforms are becoming increasingly multi-functional. This comprehensive system seamlessly integrates practicality (utilitarian aspects) and entertainment (hedonistic aspects). There are evidence indicating an increasing reliance and attachment to social media and smartphones [1–5]. According to a survey by EMI Consulting [6], 65% of teenagers are addicted to smartphones, and 69% continue to use their devices even while spending time with friends. The social media statistics on Statista show that there are an estimated approximately 4.89 billion social media users worldwide in 2023 (6.13% more than last year) [7], which represents 58.4% of the global population. Even though this meteoric figure already represents over half of the population of the earth, it's still growing. According to the latest projections, it will be almost 5.85 billion social media users by 2027. A New report on Forbes Advisor shows that the average person uses 7.5 social media platforms and spends 2 h 27 min on

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social media every day. 39% of social media users report that they are addicted to social media, and more than 78% access social media from their smartphone [8], meaning the most common way people access social media is from their mobile device.

With the rapid development of global social media, mobile phone overuse has changed people’s daily lives. Smartphone addiction impacts various aspects of life including interpersonal relationships, family dynamics, professional development, and social security in significant ways [3,4,9,10]. This issue is particularly prominent among adolescents and can lead to severe consequences. Overuse can distract students in class, impairing comprehension, participation [11], and subsequently, academic performance [12]. It may disrupt circadian rhythms, causing sleep deprivation [13]. Increased risk of depression, anxiety, Fear of Missing Out, loneliness, and a decline in multitasking capabilities have been associated with smartphone overuse among students [14,15]. Students may squander study time on social feeds and procrastinate on assignments. Impulsive in-app purchases or online shopping can strain students’ budgets. Moreover, overuse can impair real-life social skills and friendships that are crucial for college life and personal development [16].

The negative effects of addiction are particularly severe [4]. Addiction is viewed as a mental health problem, so researchers have mainly attributed it to personality traits and human psychological factors. Ding et al. [17] concluded that adolescents with poor self-control are more prone to smartphone addiction. Salehan and Negahban [18] associated personality traits such as neuroticism and low life satisfaction with adolescent smartphone addiction. Psychological characteristics, including depression, anxiety, social anxiety, boredom, and loneliness, have been identified as predictors of addictive smartphone behaviors across various ages (16–97 years) and regional groups [19–21]. In addition, designs that provide rewarding experiences, such as social networking, games, and videos, tend to increase the likelihood of smartphone addiction [22].

What factors contribute to adolescent smartphone addiction? Current interest in the study of smartphone addiction focuses largely on mental health problems and adverse outcomes, and there is a lack of discussion from the perspective of usage before-addiction [5]. Smartphone use stickiness and habit behavior were viewed as two types of behavior possibly related to smartphone addiction [4,5]. Distinguishing these forms can enhance our understanding of this issue. Use stickiness, the attention a product garners from users and their interactive behaviors, characterizes conscious smartphone use by adolescents [23]. Unconscious smartphone use, characterized by habits, is defined as behavior automatically prompted by situational cues resulting from learned cue-behavior associations [24].

Only a few studies employ a theory-focused approach to comprehend the role of pivotal factors in shaping usage before-addiction [25]. We developed a theoretical model to explain how external institutional pressures influence smartphone overuse based on the literature on institutional theory [26,27] and systems usage. Extending the findings of Zhang et al. [28] that institutional pressures drive problematic use of social media, we propose that institutional pressures play roles in smartphone usage (before-addiction), creating a study that holds significant value within the context of China. According to the newest Hofstede national culture index (2015), China’s power distance index is 80, which is much higher than the global national average of 60 [29]. Within traditional Chinese culture and social structures, there exists a considerable disparity in power, implying a greater degree of respect and obedience towards authority figures, elders, and those in positions of power. High power distance signifies that the social context wields substantial influence and control over individual behavior [30], particularly among adolescents, as their self-identity and social identity are still in developmental stages.

As mentioned above, existing analyses frame adolescent smartphone overuse as either an individual or technological issue. While some studies consider social factors, their approaches are often fragmented and need more specificity. This paper aims to comprehensively analyze the factors influencing adolescent smartphone overuse from an institutional theory perspective in the Chinese context.

Institutional theory examines how social institutional frameworks shape individual and organizational behavior and the evolution of these frameworks. This theory emphasizes the influence of formal and informal institutions on behavior. It posits that institutionalized activities arise from their impact on individuals, organizations, and inter-organizational relationships [31]. According to DiMaggio’s study, systems exert three types of isomorphic pressure on organizations: mimetic, coercive, and normative pressures [32]. This study delves into the impacts of mimetic, coercive, and normative pressures within the social environment on Chinese adolescents’ conscious (use stickiness) and unconscious (use habit) overuse of smartphones. Our theoretical model is shown in Fig. 1.

In conclusion, this paper first distinguishes the concept of adolescent smartphone overuse by dividing it into conscious and unconscious use, thereby deepening the understanding of adolescent smartphone overuse. Simultaneously, it expands the research on the

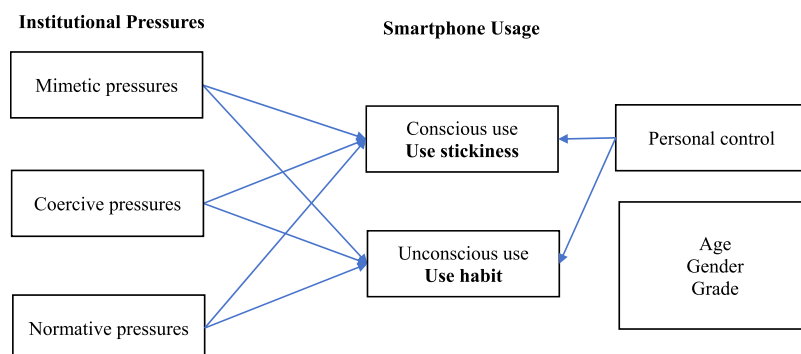


Fig. 1. Overview of Research model.

factors influencing adolescent smartphone overuse from an institutional perspective, providing a unique lens for understanding adolescents' behaviors in the digital era. This study also enriches research on the influence of institutional theory's three institutional pressures and offers contextual references for the theory.

## 2. Literature review and development of hypotheses

### 2.1. Use stickiness and use habit

Use stickiness refers to the amount of attention a product receives from users, the number of interactions, and other behaviors that indicate attention to the product. It is defined as the repeated access and use of an electronic platform. It also means that users are willing to spend a lot of time browsing and scrolling through the platform [23]. Some literature views stickiness as a platform's ability to attract and develop visitor behavior to revisit and retain them. For example, website stickiness is defined as the amount of time consumers spend using a website and the number of interactions they have with the platform [33,34]. Website stickiness is a key factor in measuring the success of e-commerce websites [35,36]. In the case of website stickiness, consumers usually spend more time and interact more with the website, which increases the possibility of sales and cultivates customer loyalty [37,38].

Stickiness occurs only when users and visitors feel comfortable, satisfied, and trust the platform they visit [39]. Some literature reviews indicate that the factors discussed in previous studies affecting stickiness intention include the content/information of the website itself, the situation, the infrastructure, the system quality, and emotional factors such as usefulness, product choice, trust, satisfaction, belonging, and positive attitude [39]. Among them, consumers' perception of cognitive and emotional factors, such as perceived usefulness, enjoyment and trust, play an important role in the formation of website stickiness [35,37,40]. Some studies have shown that website stickiness can be changed by users' perceived usefulness affecting their satisfaction with the overall website, and the perceived usefulness of the website has a positive impact on consumers' willingness to persist in using the website [37,41,42]. Meanwhile, the users' motivation to continue and share behavior has a significant positive impact on stickiness [43]. In this paper, we define the conscious smartphone use as the use stickiness.

Habit, an abstract and socially-defined concept, is often used in predicting and explaining behavior [44]. It is typically defined as a learned stimulus-response association that automatically prompts a behavior when a certain situational cue appears [24]. This behavior is reinforced through repeated actions in a specific environment, strengthening the context-behavior association and making alternative behaviors less accessible in memory [45,46]. Habitual behavior is deeply rooted in our actions, often performed unconsciously without deliberate thought [47–50]. Notably, individuals engaging in habitual behavior may not be consciously aware of their intentions [51]. Some literature further defines habitual behavior as any action or set of actions broadly controlled by habit [52].

Habitual behavior can be categorized into several types: behaviors that are habitually initiated but consciously performed (e.g., commuting by bicycle), those that are consciously initiated but habitually performed (e.g., swimming), and those that are both habitually initiated and performed (e.g., consuming unhealthy foods) [53]. Despite the resilience of strong habits, they can be changed with sufficient willpower and self-discipline [54,55].

In the field of information systems, a new concept has been put forward that the unconscious use of information technology is habitual [56]. When people use information technology as a habit, their behavior is no longer guided by personal intentions. In some studies, habit moderates the effect of intention on information technology use guidance [57–61], and influences the intention to use IT in the future [61]. In some cases, habits can also directly affect IT usage [58,59]. In this paper, unconscious smartphone use is defined as use habit. According to the literature, we use habit as the unconscious use of smartphones.

### 2.2. Theoretical basis

Many studies related to smartphone addiction have identified smartphone addiction as a psychological or psychiatric disorder. When discussing the causes of smartphone overuse, these studies often employ psychology-related theories. The most common theories include satisfaction theory, compensatory internet use theory, and attachment theory. According to the satisfaction theory, individuals choose certain media and content to satisfy their psychological needs [62]. The compensatory internet use theory suggests that people use the Internet as a form of psychological compensation, helping them to alleviate negative emotions [63]. Attachment theory emphasizes that the attachment relationships formed by individuals in childhood can affect their emotions, cognition, and behavior [64]. Individuals with insecure attachments and often have low self-esteem and self-confidence, the anonymity of the Internet can create new self-representations, compensating for an individual's reality dilemma [17,65,66].

Institutional theory is a prominent organizational theory that offers robust explanations for individual and organizational behavior and holds a key position in the field of management. It investigates the interaction between organizations and social institutions, and how these institutions shape and influence organizational behavior and performance.

Institutional theory was introduced to organizational studies by Meyer and Rowan in 1977 [67], emphasizing the impact of institutions' cultural-cognitive characteristics on organizations. In 1983, DiMaggio and Powell [32] introduced three types of mechanisms (coercive, mimetic, and normative) that promote organizational convergence due to competitive and institutionalization processes. They hypothesized that competition for legitimacy and power among businesses could lead to similarities in their structures and practices. Oliver [68] argued that institutions not only have objective immutability, but also exhibit variability, with actors capable of creating, maintaining, or disrupting institutions. The institutional theory was further refined by Scott in 1995 [69], who proposed a three-pillar framework consisting of regulatory, normative, and cultural-cognitive elements. This framework suggests that individuals interpret the external environment through unconscious cognition and conscious external restrictions reflected in social

rules and legal provisions. Formal or informal institutions profoundly influence an organization's structure, behavior, and performance by providing a stable environment but limiting freedom and choices. Over time, organizations within the same field tend to display high similarity due to the legitimacy conferred by the institutions. Furthermore, institutional constraints lead to actions that contribute to the evolution of the institutions themselves.

Three institutional pressures—mimetic, coercive, and normative—impact organizations within an institutional context [70]. Mimetic pressures suggest that organizations often mimic socially accepted practices and behavior patterns perceived as effective in an uncertain environment. This mimicking is undertaken as a means to gain social acceptance and stability. While such mimetic behavior may not always align rationally with the organization's goals and needs, it is often seen as a necessary strategy. Coercive pressure, as a part of institutional theory, refers to the formal and informal pressures exerted on an organization by other organizations upon which they are dependent and by cultural expectations in the society within which organizations function. It is often associated with the use of pressure, influence, or authority, and can come from legal and regulatory requirements, societal norms, or expectations from influential stakeholders (e.g., customers, investors, or the government). Coercive pressures can also arise from a need for legitimacy and acceptance in a particular environment or the desire to gain or maintain stability and resources. Normative pressures arise from a longstanding behavioral paradigm or social consensus within society. Rather than exerting influence through direct coercion, these pressures indirectly shape organizational behavior and decision-making through the values, beliefs, and expectations that emerge from socialization and consensus-building processes. Seen as reasonable and correct, organizations often adhere to these normative pressures from the social and cultural environment, leading them to align their actions and strategies with societal demands and expectations.

Institutional theory provides a lens for understanding how socio-environmental pressures influence behavior beyond a rational evaluation of costs and benefits. As per this theory, external social factors of mimetic, coercive, and normative pressures may directly influence adolescents' excessive use of smartphones. This study examines the impact of these pressures on adolescents' persistent use of smartphones.

### 2.3. Institutional pressures, smartphone use stickiness, and smartphone use habit

In digitalization, mimetic pressures are prevalent due to the widespread use of smartphones by those around adolescents [28,71], such as classmates and friends. As a result of similarities in age groups, social circles, and life contexts, the use of mobile applications such as social media by peers can lead to increased smartphone usage among adolescents.

Adolescents are easily influenced by their peers, especially when they feel benefits or success from such behaviors [72–74]. Therefore, under the influence of mimetic pressure, individuals are more prone to use social media in ways similar to others. This imitation and conformity can lead to dependence on social media and the overuse of smartphones, especially if the user's needs are met, or if they receive expected or unexpected rewards [28].

For example, if a club or group primarily communicates, collaborates, and shares updates through a specific social media platform, students are likely to use that platform regularly to stay engaged [18]. High-achieving members who gain popularity on a certain platform could influence others to showcase their talents. Similarly, if the students' rivals are active on specific platforms, they may feel compelled to join and engage to keep up with their peers and not risk missing out. This can lead to 'competition' on these social platforms for the most extensive friends list, most followers, or highest engagement. This aligns with the views of Lee et al. [75] that peer influence and the desire to make social connections with friends can lead to addiction.

The fear of social alienation can also play a role [76,77], such as 'If all my classmates are gaming and I'm not, I will be alienated'. Therefore, we propose the following hypotheses.

**Hypothesis 1a.** Mimetic pressures are positively associated with smartphone use stickiness among adolescents.

**Hypothesis 1b.** Mimetic pressures are positively associated with the formation of smartphone use habits among adolescents.

As smartphone applications diversify and become increasingly prevalent in the field of education [78–80], adolescents are gradually facing coercive pressures primarily from their environments, such as schools and families. In this context, "coercion" refers to the pressure on adolescents to use smartphones for various tasks and activities in different situations, such as attending online classes, checking in online, participating in online surveys, e-learning, and connecting with family members. Under coercion, individuals are required to spend more time using smartphones in order to meet organizational or environmental requirements and norms [28,81].

For instance, schools may shift student learning activities such as courses, homework, and research projects, to digital platforms. Sometimes, a teacher will post a new assignment or homework assignment, requiring students to browse their smartphones, or the teacher will share educational content on popular platforms, which could encourage students to use social media more frequently for learning. This shift can make digital engagement mandatory and normalize the constant monitoring of digital analytics such as notifications, shares, and likes. This could gradually exacerbate the adolescents' competitive mentality and fear of missing out, and in the end reinforce their persistent use of smartphones and facilitate their formation of smartphone use habits.

In response to these coercive pressures, adolescents may rationalize their smartphone use as 'I'm using my phone because I have to participate in an online class' or 'I'm using my phone because my teacher asked me to' Based on this understanding, we propose the following hypotheses.

**Hypothesis 2a.** Coercive pressures are positively associated with smartphone use stickiness among adolescents.

**Hypothesis 2b.** Coercive pressures are positively associated with the formation of smartphone use habits among adolescents.

In the era of digitalization, smartphone usage has become an integral part of people's lives [4], a 'way of life' and a 'daily habit' that everyone follows. Today, some argue that smartphones enhance productivity with their myriad of apps and knowledge access [82,83]. Others cite studies showing how they can negatively impact focus, attention spans, and privacy [84,85]. However, the dominant view is that smartphones are incredibly convenient tools that allow easy access to information, communication, entertainment, and more. When individuals find themselves in a social environment where social media is widely accepted as inevitable and indispensable, they voluntarily and unconsciously conform to these practices [25]. Over time, people take these practices for granted and begin to believe that using social media is the 'only' way to do things [86].

The pervasive presence of normative pressures in society leads adolescents to use and navigate their smartphones constantly [87, 88]. Adolescents develop attitudes such as, 'Everyone uses smartphones in the modern age, there isn't anyone who doesn't' and 'It's normal to use smartphones, and those who don't know how to use them will be left behind'. Based on this understanding, we propose the following hypotheses.

**Hypothesis 3a.** Normative pressures are positively associated with smartphone use stickiness among adolescents.

**Hypothesis 3b.** Normative pressures are positively associated with the formation of smartphone use habits among adolescents.

These are the hypotheses we have developed under the institutional theory perspective that affect the persistence of smartphone use and the formation of smartphone use habits among young people. We will test these hypotheses empirically.

### 3. Method

#### 3.1. Sample and procedure

Due to resource constraints and the voluntary nature of students participation, we employed convenience sampling to collect data. We selected participants from undergraduate students currently enrolled at a university in southern China for several reasons. Firstly, according to the World Health Organization (WHO), adolescence is typically defined as the period between 10 and 19 years of age. However, other sources may extend the adolescent stage to include individuals up to 24 years of age. For instance, the United Nations defines adolescents as individuals between the ages of 10 and 24. This extended definition takes into account the prolonged period of physical, cognitive, and psychosocial development to capture the full spectrum of adolescent experiences. The age range of undergraduate students typically ranges from 18 to 22 years, allowing them to be selected as a suitable sample for this study. Secondly, adolescence is a critical period characterized by significant cognitive, psychological, and social changes. This stage is marked by the development of various characteristics, including self-esteem, emotional dispositions, and personal autonomy. In the educational context of China, compared to junior high and high school, the university environment offers greater freedom, providing conditions conducive to the cognitive, psychological, and personal development of adolescents. Specifically, university students are typically immersed in a more complex and diverse social environment compared to middle and high school students, which may influence their smartphone usage behavior. Therefore, studying university students allows for a more comprehensive understanding of the relationship between external institutional pressures and excessive smartphone use. Thirdly, one author of this paper is a faculty member at the university, it was relatively easy to obtain data on college students. Our data cover the students studying various majors such as aerospace, mechanics, biology, journalism and communication, public health administration, and arts management, and the student sample is broadly representative. By choosing undergraduate students, the sample can capture this diversity, allowing for a broader representation of adolescents with different experiences and perspectives. A pretest was administered to 100 students, after which the scale and questions were revised and the study was formally measured.

In accordance with ethical guidelines, this study received approval from the Institutional Review Board of School of Journalism and Communication, Xiamen University (Ethical Approval Number: 22FGLB086). We conducted our study using an anonymous online survey method to collect data and included the informed consent at the outset of the questionnaire. Participants were provided with detailed information regarding the purpose of the study, their rights as participants, confidentiality measures, and the voluntary nature of their participation. They were also informed of their right to withdraw from the study at any time without consequence. The study procedures were conducted in accordance with the ethical principles.

To determine how many respondent data will be required, Israel recommended the formula [89], as shown in Equation  $n = N/(1 + Ne^2)$  where  $n$  is the sample size, and  $N$  is the size of the population,  $e$  is the desired level of precision (5%, 7%, and 10%). For example, for the current study, the desired level of precision was 7% where Confidence Level is 95% and  $P = .5$  (maximum variability), the size of population (undergraduate students) is 21,000, and the sample size is 202.

In addition, according to Rahaman's recommends that for the research model [90] using covariance Based-Structural Equation Modeling (CB-SEM) statistical technique for social science researchers, and over 200 is a large sample size. Therefore, considering above two rules, our targeted responses are over 200.

The data collection took place from October 2022 to November 2022. To minimize the common source bias, we used two stages of data collection (1-month interval). At Time 1, we distributed our survey to 484 students and collected their demographic information and their perceived levels of mimetic pressure, coercive pressure, and normative pressure. In this wave data collection, 385 participants completed the survey (response rate = 79%). At Time 2, we distributed our survey to 385 students and asked them to rate their smartphone use stickiness and habit. In the second wave data collection, 335 participants completed the survey (response rate = 87%). We asked each student to write their initials on their respective questionnaire and to include the last four digits of their smartphone number to make it easier for us to match the data. Following the matching and elimination of invalid questionnaires collected in both

stages, a valid sample of 309 students remained, constituting an overall response rate of 63.8%. Of the 309 samples, 175 were female, 134 were male. The age distribution was as follows: 1.62% were 17 years old or younger, 53.72% were 18 years old, 26.54% were 19 years old, 17.48% were 20 years old, and 0.65% were 21 years old or older. Additionally, 6.15% were first-year students, 36.57% were second-year students, 45.31% were third-year students and 11.97% were in their fourth year (Appendix A).

### 3.2. Measures

The measurement scale used in this study had been established in English. We employed the back translation procedure to confirm the accuracy and clarify the Chinese version of the scale items [91]. The original instrument was initially translated from English to Chinese, and the back-translation technique was applied with the help of two bilingual professors translating the instrument back into English. All variables were assessed on a 7-point Likert scale ranging from 1 = strongly disagree to 7 = strongly agree. Appendix B for a list of all items was demonstrated.

**Mimetic Pressure.** Following the prior studies [27,28], this construct was measured in terms of the perceived extent to which competitors have benefited from using smartphones. At time 1, students completed the 3-item mimetic pressure questionnaire [28]. Sample item included “My rivals who have used smartphones have greatly benefited; My rivals who have used smartphones are favorably perceived by other classmates; My rivals who have used smartphones are favorably perceived by other teachers. “The coefficient alpha of this scale was 0.784.

**Coercive Pressure.** At time 1, according to the previous research [27,28], the construct was operationalized in terms of the extent of formal and informal pressures perceived under the competitive conditions, and requirements and incentives from the school, teachers and classmates. We measured coercive pressure with seven items from Zhang et al. [28]. A sample item is “My school requires me to use the smartphone for tasks”. The coefficient alpha of this scale was 0.914.

**Normative Pressure.** According to Liang et al. [27] and Zhang et al.’s [28] recommendations, this refers to the perceived extent to which personnel concerned members (e.g., teachers, classmates, friends, and family) have used smartphones. At time 1, we measured normative pressure with five items from Zhang et al. [28]. A sample item is “My classmates use smartphones”. The coefficient alpha of this scale was 0.901.

**Use Stickiness.** At Time 2, we measured smartphone use stickiness. The measurement of smartphone use stickiness is based on the scale proposed by Chiang & Hsiao [92]. Its main content is “I would stay longer on smartphone than on others”, “I would stay on smartphone as often as I can” and “I am willing to continuously visit smartphone”. The coefficient alpha of this scale was 0.70.

**Use Habit.** At Time 2, we measured smartphone use habit with three items developed by Limayem and Hirt [93]. Two sample items are: “The use of a smartphone has become a habit for me” and “I don’t even think twice before using a smartphone”. The coefficient alpha of this scale was 0.747.

**Control Variables.** Personal Control. This study controls personal control because many studies suggested that addiction behaviors are related to self-regulation [94]. We measured personal control with five items from Pearlin and Schooler [95]. A sample item is “PC1. I have little control over the things that happen to me”. The coefficient alpha of this scale was 0.90. We also control for Age, Gender, and Grades on account of the potential impact of individual demographics. Gender was coded as 1 representing male and 2 representing female.

## 4. Results

Exploratory factor analyses were conducted on the six variables, namely mimetic pressure, coercive pressure, normative pressure, conscious smartphone use (use stickiness), unconscious smartphone use (use habit), and personal control (see Appendix C).

These factors collectively accounted for 69.99% of the variance in item scores. The first factor, normative pressure, explained only 27.93% of the variance, well below the 50% benchmark used in Harman’s single-factor test to determine the presence of common method variance [96]. This result suggests that common method bias may not be an issue. All items were loaded on their respective underlying factors, ranging from 0.534 to 0.871. The cross-loadings were less than 0.40. These results provide preliminary evidence that the measures exhibit convergent and discriminant validity.

Furthermore, to examine the convergent and discriminant validity of our main variables, we conducted confirmatory factor analyses using AMOS 24.0. We examined a six-factor model in which mimetic pressure, coercive pressure, use stickiness, use habit, and

**Table 1**  
Results of confirmatory factor analysis.

Model	$\chi^2$	df	IFI	TLI	CFI	RMSEA
Full model	672.079	284	0.924	0.905	0.923	0.064
Five-factor <sup>a</sup>	854.304	289	0.890	0.864	0.888	0.076
Four-factor <sup>b</sup>	1871.929	293	0.691	0.626	0.688	0.127
Three-factor <sup>c</sup>	2048.345	296	0.657	0.589	0.654	0.133
One-factor	3043.810	299	0.463	0.363	0.457	0.165

N = 309. IFI=Incremental Fit Index; TLI = Tucker–Lewis Index; CFI=Comparative Fit Index; RMSEA = Root-Mean-Square Error of Approximation.

<sup>a</sup> Use stickiness and use habit combined.

<sup>b</sup> Mimetic pressure, coercive pressure, normative pressure combined.

<sup>c</sup> Mimetic pressure, coercive pressure, normative pressure combined. Use stickiness and use habit combined.

personal control were included. Following the prior study,  $\chi^2$ , CFI, TLI, and RMSEA were used to assess the overall model fit [97]. When CFI and TLI are all close to or above 0.90, and a cutoff value of RMSEA is below 0.08, we argue that the validation model fit was reasonable [97]. As shown in Table 1, the baseline six-factor model has satisfactory fit:  $\chi^2(284) = 672.079, p < 0.01$ ; IFI = 0.92, TLI = 0.90, CFI = 0.92; RMSEA = 0.064. In addition, all the factor loadings were significant, all of them demonstrating convergent validity. The discriminant validity of the four constructs were tested by contrasting the six-factor model against four alternative models. We created the one-factor model by combining all items into one “grand” latent factor.

The five-factor model had been created by combining two dependent variables (use stickiness and use habit) into one factor. The four-factor model had been created by combining three determinants (mimetic pressure, coercive pressure, normative pressure) into one factor. The three-factor model had been created by combining three independent variables (mimetic pressure, coercive pressure, normative pressure) into one factor and two dependent variables (use stickiness and use habit) into one factor. The CFA results of those alternative models indicated that the alternative models yielded poor fits with the data. Thus, the discriminant validity of the constructs were confirmed. We reported the goodness-of-fit statistics for the five constructs in Table 1. Furthermore, we assessed the discriminant validity of the main variables in the model using the heterotrait–monotrait (HTMT) ratio. The HTMT approach provides a robust method for evaluating discriminant validity, as it mitigates bias in estimating parameters of the structural model and has demonstrated reliable performance [98]. As shown in Table 2, the HTMT values were below 0.90, in line with the suggested rule of thumb [98].

#### 4.1. Descriptive statistics

Table 3 contains the means, standard deviations, and correlations for all study variables. The reliabilities of our variables are above 0.70, and their correlations are as expected. Results showed that three dependent variables (mimetic pressure, coercive pressure, normative pressure) were positively correlated with two independent variables (use stickiness and use habit). These evidences provided initial support for our hypotheses. To test the individual effects of many explanatory variables on dependent variables, we consider the possible inherent collinearity (multicollinearity) of confounded explanatory variables. As a measure of multicollinearity in the model, the variance inflation factor (VIF) and tolerance levels are used. According to Table 4 below, VIF result shows that all four independent variables values are less than 2.50 and tolerance values are greater than 0.40 [99]. Therefore, diagnostic testing indicates that multicollinearity assumption is not violated.

#### 4.2. Structural model assessment

The structural model was tested using IBM SPSS Amos 24.0. Based on the measurement model, the proposed model was conducted, and the variables which included the control variables were loaded onto hypothesized paths. Fig. 2 presents the results for our hypotheses. Specifically, there was a positive relationship between coercive pressures and use stickiness ( $\gamma = 0.187, p < 0.05$ ) and coercive pressures and habit ( $\gamma = 0.572, p < 0.001$ ). Mimetic pressure was positively associated with use stickiness ( $\gamma = 0.183, p < 0.05$ ), whereas the positive effect of mimetic pressures on use habit was not significant. Normative pressure was positively associated with habit ( $\gamma = 0.20, p < 0.001$ ). However, the relationship between normative pressure and use stickiness was non-significant. Surprisingly, personal control was significantly related to use stickiness negatively ( $\gamma = -0.278, p < .001$ ), and not significantly related to habit.

Taken together, our analysis supported four hypotheses (H1a, H2a, H2b, H3b). Two hypotheses (H1b, H3a) were not supported. These results provide important insights into the linkages between mimetic pressure, coercive pressure, normative pressure, and smartphone use stickiness and use habit among adolescents. The total percentage of variance explained using stickiness was 17.5% and the total percentage of variance explained by habit was 50.3%.

Personal control is a concept that involves the control, decision-making, and self-regulation of one’s actions. At the same time, relevant studies proved that adolescents often lack effective adjustment ability and may be more inclined to relieve and compensate through mobile phones, thus increasing the risk of smartphone addiction [100]. The data of this study show that personal control as a control variable has a negative effect on conscious smartphone use, while the effect on unconscious smartphone use is not significant.

**Table 2**  
Discriminant validity of The Main variables (HTMT).

Variable	1	2	3	4	5
1.Mimetic pressure	0.408 [0.248; 0.552]	0.240 [0.117; 0.377]	0.235 [0.119; 0.339]	0.314 [0.142; 0.487]	0.050 [0.028; 0.059]
2.Coercive pressure		0.481 [0.358; 0.593]	0.275 [0.162; 0.387]	0.682 [0.544; 0.812]	0.141 [0.087; 0.203]
3.Normative pressure			0.161 [0.074; 0.262]	0.460 [0.331; 0.589]	0.201 [0.089; 0.323]
4.Use stickiness				0.240 [0.125; 0.358]	0.268 [0.152; 0.369]
5.Use habit					0.092 [0.048; 0.131]

N = 309. Off-diagonal elements above the diagonal are the heterotrait-monotrait ratios of correlations (HTMT), and their respective confidence intervals at the 95% significance level.

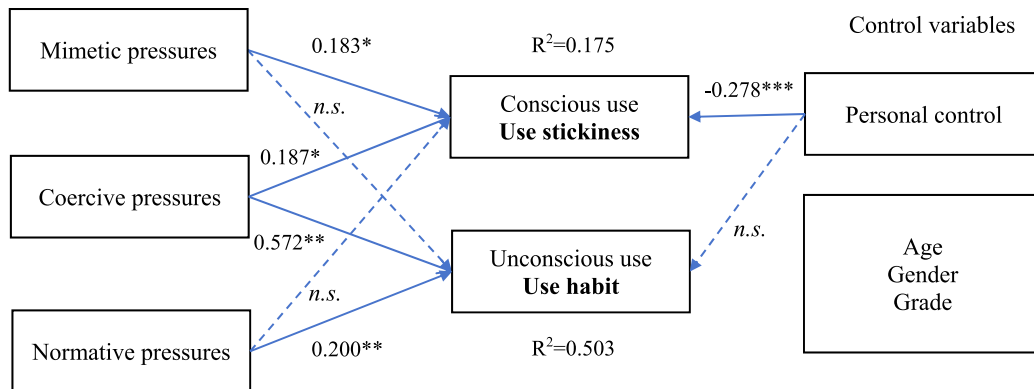
**Table 3**  
Means, standard deviations, correlation matrix.

Variable	1	2	3	4	5	6	7	8	9
1. Gender	–								
2. Age	–0.025	–							
3. Grade	–0.007	0.899**	–						
4. Mimetic pressure	0.063	0.020	0.063	(0.784)					
5. Coercive pressure	0.140 <sup>a</sup>	–0.005	0.042	0.344**	(0.914)				
6. Normative pressure	–0.069	–0.084	–0.030	0.199**	0.431**	(0.901)			
7. Use stickiness	–0.001	0.127 <sup>a</sup>	0.121	0.170**	0.220**	0.125 <sup>a</sup>	(0.700)		
8. Use habit	0.179**	0.044	0.053	0.236**	0.561**	0.378**	0.177**	(–0.747)	
9. Personal control	0.051	0.142 <sup>a</sup>	0.154 <sup>a</sup>	–0.004	0.127 <sup>a</sup>	0.186**	0.059	–0.187**	(0.900)
Mean	1.566	2.618	2.631	5.071	6.123	6.253	5.945	5.282	3.244
SD	0.497	0.809	0.773	0.984	0.840	1.102	0.907	0.980	1.427

<sup>a</sup> N = 309. Reliabilities are on the diagonal in parentheses. Off-diagonal elements below the diagonal are correlations among the constructs.

**Table 4**  
Results of multicollinearity analysis.

Independent Variables	Use habit		Use stickiness	
	Collinearity Statistics		Collinearity Statistics	
	Tolerance	VIF	Tolerance	VIF
Gender	0.880	1.137	0.880	1.137
Age	0.970	1.031	0.970	1.031
Grade	0.903	1.107	0.903	1.107
Personal control	0.690	1.450	0.690	1.450
Normative pressure	0.692	1.444	0.692	1.444
Coercive pressure	0.878	1.139	0.878	1.139
Mimetic pressure	0.966	1.035	0.966	1.035



**Fig. 2.** Result of structural model.

## 5. Discussion

### 5.1. Summary of main findings

Adolescent smartphone overuse has received extensive attention from scholars as a social problem. However, prior research on the antecedents of adolescent smartphone overuse focused on individual-level and technology-level elements. This study utilizes an institutional perspective to explore the possible effects of external social environmental pressures on adolescent smartphone overuse. The findings of this paper suggest that the coercive pressures in the institutional elements have a positive impact on both adolescents' smartphone use stickiness and smartphone use habits. The mimetic pressures in the institutional elements have a positive effect on adolescents' smartphone use stickiness, but not on the formation of adolescents' smartphone use habits. The normative pressures in the institutional elements affect the formation of adolescents' smartphone use habits but do not affect adolescents' smartphone use stickiness. Our empirical results also show that the sense of personal control has no effect on smartphone use habits but has an effect on use stickiness.



## 5.2. Theoretical implications

Our study makes three significant contributions to the existing literature. First, this research enhances understanding of the role of institutional pressures in shaping adolescent digital behavior, specifically in adolescent smartphone overuse [101]. Past research concerning the causes of excessive smartphone use among adolescents has exclusively concentrated on smartphone users' personality traits, psychological traits, and smartphone technology traits [17,18]. However, it is worth considering adolescents' minds are not yet fully mature. Thus, their behaviors are largely susceptible to the influence of their surroundings [102]. From the perspective of environmental interaction, some research indicates that the time mothers spend with their adolescent children and the quality of parent-child interaction play a significant role in adolescents' smartphone use [103], but these kinds of interventions and prevention strategies are not systematically addressing the surroundings' influences. In our research, we applied an institutional perspective to explain adolescent smartphone overuse, which can provide a more comprehensive understanding of how external institutional environments impact the adolescents' digital behaviors. The research underscores the role of digitalization in societal change, particularly in shaping behaviors and norms [104] and adds to the body of literature on the societal implications of digitalization, providing a foundation for further study in this area [105], such as online learning, cyberbullying, and other related topics [101].

This study addresses the gap in institutional theory within adolescent behavioral studies by integrating institutional theory to reveal the pivotal role of institutional pressures in influencing adolescents' excessive use of smartphones. Specifically, this study delves into the diverse impacts of three types of institutional pressures [32] (coercive, mimetic, and normative institutional pressures) on adolescents' excessive smartphone use. Past research on institutional theory has predominantly focused on explaining organizational behaviors, economic development, environmental management [106–109]. Some studies have introduced institutional theory into the field of education, explaining the effect of the educational reform and education policies [110]. However, the application of institutional theory in understanding adolescent behavior remains largely unexplored. We addressed this research gap by using an empirical research design to provide empirical evidence about the detrimental effect of institutional pressures on adolescents' excessive smartphone use.

This study also contributes to the growing body of research on adolescent smartphone overuse by distinguishing between conscious and unconscious smartphone use. By investigating the influences of various institutional pressures and the role that personal control plays on these two types of smartphone use among adolescents, we achieved a deeper understanding of the complex dynamics involved. This not only enriches the existing literature on adolescent behavior and smartphone use but also provides valuable insights for educators, parents, and policymakers seeking effective strategies to manage smartphone use among adolescents. Our findings underline the need for multi-faceted approaches that consider, conscious and unconscious factors, institutional influences, and personal control abilities in addressing the issue of adolescent smartphone overuse. These findings contribute significantly to advancing research in educational policies and students' academic performance [108, 111], facilitating the quest for more informed approaches towards addressing adolescent smartphone usage.

## 5.3. Practical implications

Our research brings significant implications for practice. The influence of socio-environmental pressures on individual behavior is significant; this study's analysis and theoretical explanations of the factors influencing adolescent smartphone overuse can help policymakers concerned about adolescent smartphone overuse formulate favorable policies and implement appropriate interventions. If adolescents can clearly understand why they are unknowingly deeply involved in smartphones, initiating their metacognition about smartphone overuse may also benefit adolescents' self-control behaviors.

Firstly, recognizing the significant impact of coercive pressures on adolescents' smartphone use, policy makers can take concrete steps to develop targeted policies and programs aimed at fostering healthy smartphone habits and enhancing digital literacy. For instance, educational institutions can implement measures to restrict access to non-educational online platforms, allocating time exclusively for valuable online activities. Simultaneously, policymakers should focus on public health strategies by extensively educating youth regarding the potential risks associated with excessive smartphone usage and at the same time advocating digital health. This could involve organizing interactive workshops or seminars on digital literacy, challenging prevailing norms, and emphasizing the need for mindful smartphone use.

Secondly, parents and guardians play a pivotal role by understanding and addressing the social pressures influencing their children's smartphone habits. They can lead by example; demonstrating responsible smartphone can guide their children to do the same. Creating a positive familial environment can significantly influence adolescents' smartphone behaviors.

Thirdly, adolescents themselves should gain awareness regarding the drivers behind their excessive smartphone use, striking a balance between utilizing smartphones for informational, social, and entertainment purposes while avoiding overuse. They should proactively create plans to prioritize rest and set limits on smartphone usage. This way, they can effectively manage external pressures to develop healthier smartphone habits and mitigate excessive usage tendencies.

## 5.4. Limitations and future directions

Despite the valuable insights gained from this study, there are some limitations. Firstly, the sample consisted of participants from only one university in China, which may affect the application of results into broader contexts. Future research should diversify the sample by considering various student types, school environments, and sociocultural backgrounds to better comprehend the nuanced influence of institutional stress on smartphone usage among adolescents.

Secondly, the self-reported data used in this study may present issues related to recall bias or social desirability bias, which may affect the data accuracy. To mitigate this, future studies could incorporate more objective data collection methods, such as involving parents in assessing adolescents' smartphone use behaviors. Moreover, employing longitudinal designs would enable tracking changes in smartphone habits, providing a clearer understanding of how institutional pressures influence these behaviors over time.

Thirdly, our study only examined the impact of three institutional pressures—normative, coercive, and mimetic—on adolescent smartphone overuse, leaving room for further exploration of how these pressures influence different types of overuses. Future research could delve deeper into the mediating and moderating variables of these institutional pressures on adolescent smartphone use. For instance, normative pressures might operate through mechanisms of conformity and social identity, coercive pressures through loss aversion and punishment avoidance, and mimetic pressures through social and observational learning. This offers a wide scope for future investigations. Also, future research could consider other more concrete potential factors influencing smartphone usage, such as parental mediation, peer influence, or psychological factors like self-esteem or fear of missing out.

Finally, while this study focused on the conscious and unconscious smartphone use of adolescents, future research could extend this framework to examine the effects of institutional pressures on other conscious and unconscious behaviors. Adolescent behaviors can be categorized as conscious (decision-making, reasoning, reflection, goal setting, and risk taking [112,113] or unconscious (social mimicry and impulsive responses). Some behaviors, like language use [114], sports [115], eating habits, emotional regulation [116], and hygiene habits [45], can manifest as both conscious and unconscious. Categorizing these behaviors can further refine our understanding of adolescent behavior and provide a more detailed framework for future research.

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Nothing declared.

### Data availability statement

'Number of social media users worldwide from 2017 to 2027' and 'Top social media statistics and trends of 2023' have been deposited into a publicly available repository (Please see references 7 & 8). The other data associated with our study has not been deposited into a publicly available repository, but it will be made available on request.

### CRediT authorship contribution statement

**Haiqing Bai:** Writing – review & editing, Writing – original draft, Validation, Software, Project administration, Methodology, Formal analysis, Conceptualization. **Jiatong Liu:** Writing – original draft, Validation, Software, Methodology, Conceptualization. **Wenshi Bai:** Validation, Software, Resources, Formal analysis, Conceptualization. **Ting Cao:** Writing – review & editing, Writing – original draft, Validation, Data curation, Conceptualization.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Appendix A. . Demographic profile of respondents (N = 309)

Attributes	Categories	Number	Percentage
Gender	Male	134	56.63%
	Female	175	43.37%
Age	<17 years old	5	1.62%
	18 years old	166	53.72%
	19 years old	82	26.54%
	20 years old	54	17.48%
	≥21 years old	2	0.65%
Grade	First year	19	6.15%
	Second year	113	36.57%
	Third year	140	45.31%
	Fourth year	37	11.97%

### Appendix B. Measurements of Variables

Three Institutional Pressures from Liang et al. (2007) and Zhang et al. (2023).

*Mimetic Pressure*

My rivals who have used smartphone ...

MF1. have greatly benefitted.

MF2. are favorably perceived by other classmates.

MF3. are favorably perceived by other teachers.

*Coercive Pressure*

CF1. My teachers require me to use smartphone to connect with them.

CF2. My classmates require me to use smartphone to connect with them.

CF3. My family require me to use smartphone to connect with them.

CF4. My friends require me to use smartphone to connect with them.

CF5. My school requires me to use smartphone for tasks.

CF6. My clubs require me to use smartphone to connect with them.

CF7. My study requires me to use smartphone for it.

*Normative Pressure*

NF1. My teachers use smartphone.

NF2. My classmates use smartphone.

NF3. My friends use smartphone.

NF4. My family use smartphone.

NF5. Members of my clubs use smartphone.

*Smartphone Use stickiness From Chiang & Hsiao (2015)*

MS1. I would stay longer on smartphone than on others.

MS2. I would stay on smartphone as often as I can.

MS3. I am willing to continuously visit smartphone.

*Smartphone use habit from Limayem and Hirt (2003)*

HB 1. Using smartphone has become natural to me.

HB 2. The use of smartphone has become a habit for me.

HB 3. I don't even think twice before using smartphone.

*Personal Control From Pearlin and Schooler (1978)*

PC1. I have little control over the things that happen to me. (R).

PC2. There is really no way I can solve some of problems I have. (R).

PC3. There is little I can do to change many of the important things in my life. (R).

PC4. I often feel helpless in dealing with problems of life. (R).

PC5. Sometimes I feel that I am being pushed around in life. (R).

**Appendix C. Exploratory Factor Analysis**

	Coercive pressure	Personal control	Normative pressure	Mimetic pressure	Smartphone use stickiness	Smartphone use habit
CF2	0.887	0.065	0.107	0.112	0.149	0.060
CF4	0.855	0.101	0.114	0.017	0.142	0.163
CF6	0.798	-0.024	0.173	0.012	0.032	0.176
CF3	0.794	-0.010	0.112	0.077	-0.032	0.063
CF5	0.761	0.027	0.145	0.179	0.025	0.159
CF1	0.739	0.018	0.168	0.238	0.088	0.023
CF7	0.534	0.148	0.164	0.035	0.075	0.227
SC3_R	0.147	0.871	0.107	0.004	0.009	-0.017
SC4_R	-0.015	0.870	0.076	-0.020	-0.056	0.075
SC2_R	-0.077	0.850	0.062	-0.010	-0.036	-0.071
SC1_R	0.114	0.798	0.058	-0.046	-0.165	-0.015

(continued on next page)

(continued)

	Coercive pressure	Personal control	Normative pressure	Mimetic pressure	Smartphone use stickiness	Smartphone use habit
SC5_R	0.070	0.790	0.059	0.050	-0.035	0.075
NF2	0.026	0.029	0.836	0.131	-0.021	0.079
NF1	0.293	0.141	0.835	0.005	0.043	0.155
NF3	0.269	0.103	0.832	0.016	0.058	0.088
NF5	0.265	0.098	0.810	0.035	0.067	0.137
NF4	0.079	0.046	0.792	0.036	0.051	0.020
MF2	0.195	-0.020	0.053	0.844	0.126	0.079
MF	0.041	0.002	0.017	0.817	-0.067	0.014
MF1	0.211	-0.001	0.112	0.750	0.128	0.020
MS1	0.078	-0.137	0.058	0.140	0.817	0.062
MS2	-0.018	-0.261	0.052	0.082	0.777	0.066
MS3	0.250	0.108	0.037	-0.048	0.680	0.011
HB2	0.298	0.020	0.041	0.044	0.117	0.807
HB3	0.106	-0.001	0.211	0.033	-0.006	0.754
HB1	0.507	0.019	0.162	0.063	0.066	0.659
Statistics						
Eigenvalue	7.263	3.799	2.443	1.859	1.551	1.283
Variance explained	27.935	14.611	9.396	7.151	5.967	4.933
Cumulative explained variance	27.935	42.546	51.942	59.093	65.060	69.993

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