

Network Environments in Teenagers' Behaviors and Mental Development

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Abstract: The current study aimed to examine how different aspects of the network environments—specifically online shopping, social media, online search, and AI tool use—affect the mental health and social behaviors of Chinese teenagers. 230 teenagers participated in this study and they completed a series of questions in a self-reported survey. The questions included three dimensions: digital engagement (e.g., use of social media, AI tools, and online shopping), mental health (e.g., depression, anxiety, self-esteem), and social behaviors (e.g., empathy, cooperation, adaptability). Drawing upon correlation and regression analysis, the study found that digital engagement had weak or inconsistent correlations with mental health outcomes but showed significant positive associations with social behaviors. In particular, AI tool use and online shopping were strong predictors of skills such as problem-solving, empathy, and collaboration. These findings suggest that the way teenagers use digital tools may matter more than how often they use them, especially in educational and social development contexts.

1. Introduction

The rapid growth of the digital world has created a network environment that is increasingly interwoven with everyday life, particularly for teenagers. As they navigate social media platforms, online communities, and an abundance of digital information, these young individuals are exposed to various influences that can shape their behaviors and impact their mental development. Generation Z, typically born between 1997 and 2012, has grown up during the rise of smartphones and social media, making them the first true “digital natives.” They are highly connected to network environments and receiving information quickly and visually. This makes them especially sensitive to the benefits and risks of online engagement. On one hand, the network environment provides opportunities for enhanced learning, social interaction, and self-expression. On the other hand, it poses risks such as cyberbullying, exposure to harmful content, and the development of addictive tendencies. The current study aims to explore the manner in which network environments affect teenagers’ behaviors and psychological well-being. By examining key factors—such as social media use, online search, and AI use—it seeks to shed light on the effects of network influences on teenagers. Ultimately, the findings gathered make a potential contribution to an understanding of the challenges and opportunities facing today’s digitally connected youth.

2. Theoretical Framework

2.1 Social Learning Theory (Bandura, 1977)

The Social Learning Theory, formulated by Bandura^[1], emphasizes that behavior is acquired not only through direct experience but also through observing and imitating others. Central to this theory is the idea that individuals, particularly teenagers, learn social norms, values, and behaviors by watching role models in their environment---whether these role models are parents, peers, or influential figures online. Bandura states that attention, retention, reproduction, and motivation are key components of this learning process. In today's networked world, teenagers frequently encounter digital influencers and virtual communities, which can have significant implications for their behavioral and emotional development. For instance, exposure to online trends or viral content may shape their sense of identity and self-esteem, while repeated observation of negative online behaviors (e.g., cyberbullying) can normalize such actions. By understanding how exposure to source virtual spaces, relevant stakeholders can develop interventions to guide teens toward healthier digital habits and social interactions.

2.2 The Cognitive Development Theory (Piaget, 1952)

The Cognitive Development Theory, proposed by Piaget^[2], outlines how individuals progress through distinct stages of mental growth, which is characterized by increasingly sophisticated thinking processes. During adolescence---often associated with Piaget's formal operational stage---teenagers develop the ability to think abstractly, reason logically, and engage in hypothetical-deductive reasoning. In the modern network environment, this developmental stage is particularly significant as teenagers begin to form their own perspectives on complex social issues, frequently encountering diverse viewpoints in virtual spaces. Digital platforms create room for critical thinking and problem-solving, yet they also present challenges such as misinformation and echo chambers (places online where teens mostly see opinions they already agree with). As teens navigate various online sources, their cognitive development can be accelerated or hindered depending on the nature and quality of the digital content they consume. Recognizing the interplay between Piaget's developmental stages and the digital context can help educators and parents design more targeted strategies that foster resilience, autonomy, and intellectual growth among teenagers.

2.3 Digital Natives Theory (Prensky, 2001)

The Digital Natives Theory, proposed by Prensky^[3], describes how individuals who have grown up in the digital era, often referred to as "digital natives," differ in their cognitive processes, learning styles, and social interactions compared to previous generations. According to Prensky, digital natives are accustomed to processing information rapidly, multitasking, and interacting with digital devices as an integral part of their daily lives. This theory highlights how teenagers, who have been exposed to digital technologies from an early age, develop distinct patterns of thinking and behavior. While digital literacy can enhance problem-solving skills and creativity, excessive reliance on digital environments may also lead to issues such as reduced attention spans and difficulties in face-to-face communication. Therefore, immersive online environments may generate challenges in social behaviors and welfare.

3. Literature Review

3.1 Online environment and mental health in teenagers

As teenagers spend more and more time online, researchers have examined what that means for their mental health. Valkenburg, Meier, and Beyens^[4] reviewed a range of studies and concluded that while mindful social media use can provide support and connection to teenagers, over use often goes hand-in-hand with anxiety and depression.

Shensa et al.^[5] further supported this argument in a national U.S. study, showing a strong link between problematic social media habits (e.g. using it too much without real purpose) and symptoms of depression in young adults. Their study found that those who used social media more frequently, particularly for passive consumption (just scrolling and looking without liking, commenting, or posting), rather than active engagement, were more likely to report depressive symptoms. The correlation remained true after adjusting for variables like income, educational level, and relationship status.

Recently, Nick et al.^[6] introduced the term "digital stress" to describe the pressure teenagers feel to always be available online, constantly respond to messages, and stay updated with what others are posting. This pressure often comes from peers, social media norms, and the fear of missing out (FOMO) -teens worry that if they do not respond quickly or stay active, they will be excluded or judged. Their long-term study found that this stress actually predicts a rise in depressive symptoms, highlighting how online social expectations can seriously affect teen mental health.

Similarly, Primack et al.^[7] found that young people who used social media a lot felt more socially isolated - which is ironic, since social media is supposed to help people feel more connected. They analyzed data from over 1,700 young adults in the U.S., aged 19 to 32, and found that those who used social media the most were more than twice as likely to feel socially isolated. The researchers pointed out that constantly seeing others' perfect-looking moments or feeling excluded from social interactions might contribute to these feelings.

Moreno and Uhls^[8] pointed out that teens without strong offline support or those going through tough identity questions are more likely to be hurt by these negative online experiences. Their study emphasized that teens in vulnerable groups often rely more on digital validation, making them more likely to be influenced by those negative feedback and comparison, and emotional harm from social media interactions.

Another area that is noteworthy is sleep. Increased nighttime use of social media has been linked to disrupted sleep patterns, which would directly influence bad emotional regulation. Lack of sleep among teens has long been associated with increased risk of mental health disorders, making this a growing concern for psychologists and parents. Poor sleep quality caused by late-night social media use has been shown to increase symptoms of anxiety and depression in teens.

In short, while online spaces can give teens a sense of belonging and connection^[8], they can just as easily be a source of stress, isolation, and disorders if used without boundaries or external supports^[4-7].

3.2 Online environment and social behaviors in teenagers

The way teenagers connect socially has been completely transformed by the Internet. Pouwels et al. (2021) found that social media can actually bring teens closer to their friends. Their study used real-time experience sampling to show that during social media interactions, teens often reported increased feelings of connection and enjoyment. Similarly, van der Wal et al.^[9] talked directly to teens and found that many rely on platforms to stay connected and express who they are. Through interviews and surveys, they discovered that platforms like Instagram and Snapchat play a central

role in how teens share their emotions and shape their identities.

Moreno and Uhls^[8] offered a helpful way to look at this by focusing on the idea of "affordances," or the different ways teens use digital tools based on their age, maturity, and personal situations. They categorized these affordances into identity, relational, and emotional, highlighting how the same digital platform could serve different purposes for different users. For some, social media helps them meet new people. For others, it leads to withdrawal and feeling overwhelmed.

Meanwhile, Siebers et al.^[10] raised concerns about how constantly switching between apps and notifications can mess with teens' ability to focus and be present in real-life interactions. Their findings suggested that high levels of multitasking through digital devices were associated with poorer attention control and reduced social sensitivity.

Van Driel et al. (2024) showed how algorithms often find teens emotionally intense content, which can warp their sense of social norms and push unhealthy comparisons. They argued that this curated content often amplifies polarizing themes, encouraging teens to react emotionally rather than reflect critically.

To show how personal these effects can be, Beyens et al.^[11] developed a model that classifies how social media impacts individuals differently. Some teens feel more socially confident after being online, while others end up feeling worse — depending on their environment, habits, and even personality. Their model emphasized that teens' outcomes are deeply influenced by variables like peer influence, and digital literacy.

Moreover, the quality of online interactions matters just as much as quantity. Positive and supportive exchanges can reinforce friendships and social skills, while toxic or exclusionary behavior — even subtle ones like being ignored in group chats — can damage a teen's sense of belonging. Educators and parents are beginning to realize that guiding teens toward healthy online communication is just as important as monitoring screen time.

In conclusion, these studies show that the online world is a complicated place for teens socially.^[8-11]

4. The Present Study

To date, existing studies have explored the influence of digital environments on teenagers, particularly in Western countries. However, there is still a dearth of studies examining how network environments affect Chinese teenagers' emotional and social development, especially within their unique cultural and educational context. The current study focuses specifically on Chinese teenagers, aiming to explore how digital environments shape their psychological well-being and social behaviors.

This study investigates two main areas:

- 1) Mental health, including depression, anxiety, stress and self-esteem.
- 2) Social behaviors, including interpersonal communication skills, empathy, problem-solving abilities, adaptability and cooperation.

To the end, two major research questions are formulated as follows:

- 1) Do network environments affect mental health in Chinese teenagers?
- 2) Do network environments affect social behaviors in Chinese teenagers?

5. Methodology

5.1 Participants

This study involved 230 teenagers (145 females, 85 males) from various regions across China, providing a diverse perspective on teenagers' digital experiences. The participants were mostly from Guangdong Province, which accounted for the largest portion of the sample. Participants ranged in

age from 13 to 20 years old (Mean age=18), and were recruited from both middle and high schools through online questionnaire.

5.2 Instruments

An online questionnaire was administered for the participants. There were three major components of the questionnaire. The participants completed the survey about 3 to 5 minutes.

The questionnaire included three sections: network environment/resources, mental health, and social behaviors.

Network environment/resources

The network environment/resources section measured four aspects: online purchasing behavior (e.g., Taobao, Meituan; sample items included online buying frequency and impulsivity), social media use (e.g., TikTok/Douyin, Rednote, WeChat; sample items focused on frequency of use, emotional responses, and social comparison), online search (sample items examined habits related to information seeking and evaluation), and AI usage (e.g., virtual agents; sample items explored the use of AI tools for academic or personal purposes).

Mental health

The mental health section assessed four dimensions: depression, anxiety, stress, and self-esteem (sample items reflected emotional states, daily stress levels, and self-perception).

Depression. The subtask measures persistent sadness, lack of interest, and emotional withdrawal. A sample item is as follows: *"I often feel down or hopeless without a clear reason."*

Anxiety. The subtask measures excessive worry, nervousness, and physical tension. A sample item is as follows: *"I feel nervous or anxious even when there is no real danger."*

Stress. The subtask measures emotional strain caused by pressure, overload, or unmet demands. A sample item is as follows: *"I feel overwhelmed by my daily responsibilities."*

Self-esteem. The subtask measures self-worth, confidence, and perceived competence. A sample item is as follows: *"I feel good about myself and what I can accomplish."*

Social behaviors

The social behaviors section included five components: interpersonal communication, empathy, problem-solving abilities, cooperation, and adaptability (sample items focused on interaction styles, emotional understanding, teamwork, and flexibility in different situations).

Interpersonal communication. The subtask measures the ability to express thoughts and listen effectively in social contexts. A sample item is as follows: *"I can express my thoughts clearly when talking to others."*

Empathy. The subtask measures emotional understanding and the ability to relate to others' feelings. A sample item is as follows: *"I try to understand how my friends feel when they are upset."*

Problem-solving. The subtask measures logical thinking and the ability to generate effective solutions. A sample item is as follows: *"When facing a problem, I can come up with more than one solution."*

Cooperation. The subtask measures teamwork, collaboration, and willingness to work with others. A sample item is as follows: *"I work well with others during group tasks or projects."*

Adaptability. The subtask measures emotional and behavioral flexibility in changing situations. A sample item is as follows: *"I adjust easily when things don't go as planned."*

6. Results

6.1 Descriptive Statistics

Table 1 and figure 1 present means, standard deviations, and observed score ranges for all study

variables. The mean scores for purchase ($M = 12.37$, $SD = 2.29$), social media ($M = 11.15$, $SD = 2.31$), online search ($M = 11.73$, $SD = 2.22$), and AI tools ($M = 10.67$, $SD = 2.62$) demonstrated moderate to high levels of online engagement among participants. mental health variables showed more variability, with depression ($M = 10.22$, $SD = 4.65$), anxiety ($M = 11.00$, $SD = 4.89$), stress ($M = 12.12$, $SD = 5.04$), and self-esteem ($M = 12.43$, $SD = 3.93$). Similarly, participants scored moderately high in social behavior indicators, including interpersonal skills ($M = 13.23$, $SD = 3.52$), empathy ($M = 13.74$, $SD = 3.51$), problem-solving ($M = 13.91$, $SD = 3.57$), cooperation ($M = 14.17$, $SD = 3.30$), and adaptability ($M = 14.20$, $SD = 3.33$).

Table 1 Descriptive table of all variables

	Mean	Standard Deviation	Minimum	Maximum
Purchase	12.37	2.29	3	15
Social Media	11.15	2.31	3	15
Online Search	11.73	2.22	3	15
AI Tools	10.67	2.62	4	15
Depression	10.22	4.65	4	20
Anxiety	10.74	4.71	4	20
Stress	10.51	4.53	4	20
Self-Esteem	12.96	3.44	4	20
Interpersonal Skills	13.83	2.89	4	20
Empathy	14.1	2.78	4	20
Problem-Solving	13.52	2.73	4	20
Cooperation	13.94	2.82	4	20
Adaptability	13.93	2.79	4	20

Table 2 presents bivariate Pearson correlations among the study variables. Purchase was positively associated with all social behavior indicators ($r = .43$ to $.53$, all $ps < .001$), while showing negligible or negative associations with mental health. Social media and AI tools were positively and significantly correlated with both mental health and social behavior outcomes, with the strongest effects for AI tools and problem-solving ($r = .55$, $p < .001$), and AI tools and cooperation ($r = .59$, $p < .001$). depression, anxiety, and stress were highly interrelated ($r > .90$, $p < .001$), but showed weaker relationships with online engagement metrics. Self-esteem was positively associated with AI tools ($r = .39$, $p < .001$), online search ($r = .30$, $p < .001$), and purchase ($r = .31$, $p < .001$), suggesting a potential link between online activity and personal well-being.

Table 2 Bivariate correlations of all variables

	Purchase	Social Media	Online Search	AI Tools	Depression	Anxiety	Stress	Self-Esteem	Interpersonal Skills	Empathy	Problem-Solving	Cooperation	Adaptability
Purchase													
Social Media	0.61**												
Online Search	0.66**	0.70**											
AI Tools	0.42**	0.55**	0.62**										
Depression	-0.10	0.08	0.03	0.23**									
Anxiety	-0.04	0.09	0.09	0.25**	0.90***								
Stress	-0.05	0.13	0.09	0.27**	0.91***	0.94**							
Self-Esteem	0.31**	0.24**	0.30**	0.39**	0.37***	0.41**	0.44**						
Interpersonal Skills	0.46**	0.41**	0.48**	0.56**	0.27***	0.29**	0.31**	0.64**					
Empathy	0.53**	0.50**	0.56**	0.55**	0.30***	0.34**	0.35**	0.56**	0.74***				
Problem-Solving	0.43**	0.45**	0.54**	0.55**	0.41***	0.38**	0.43**	0.59**	0.81***	0.74**			
Cooperation	0.49**	0.43**	0.51**	0.59**	0.31***	0.29**	0.32**	0.62**	0.79***	0.76**	0.84***		
Adaptability	0.45**	0.39**	0.48**	0.50**	0.32***	0.32**	0.35**	0.58**	0.83***	0.75**	0.84***	0.82***	

** $p < .01$, *** $p < .001$

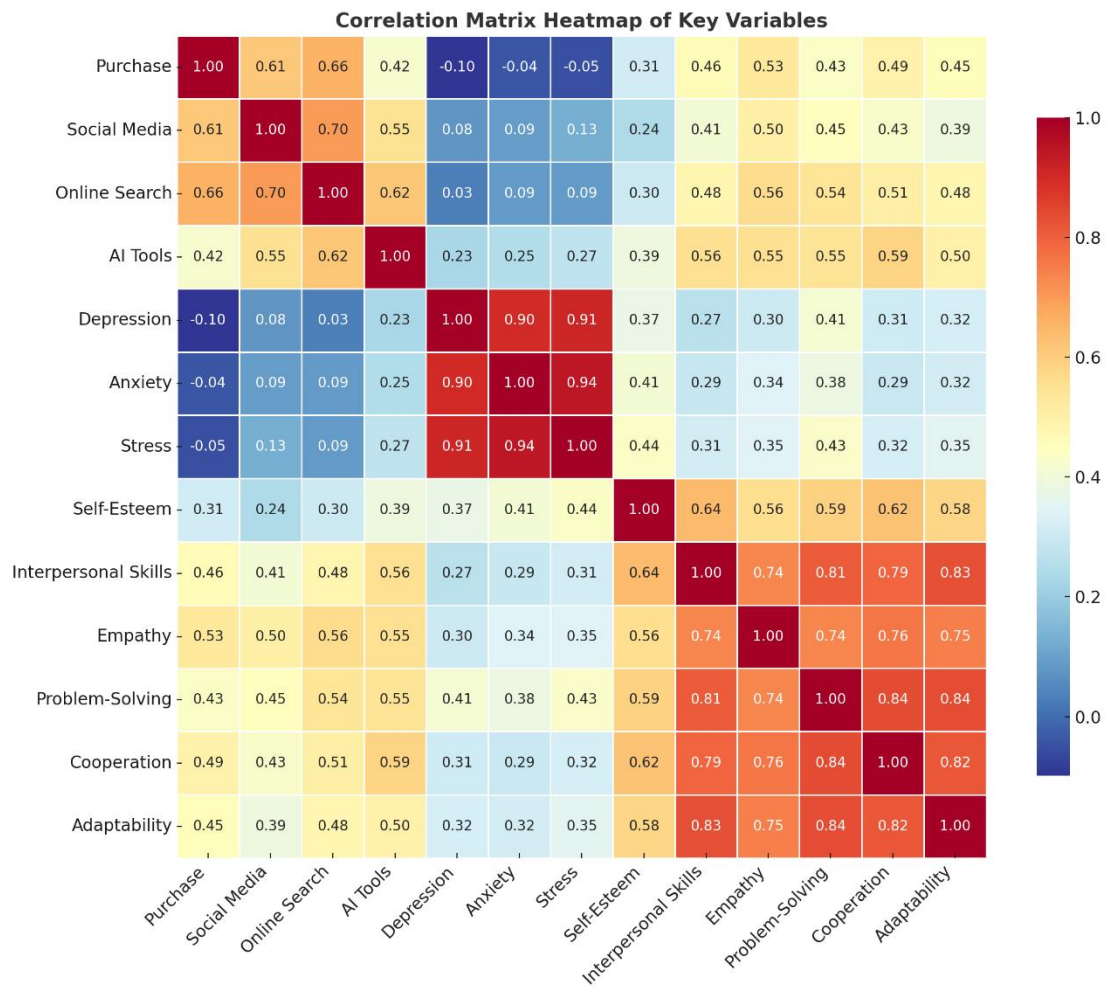


Fig. 1 Heatmap of the correlations

6.2 Regression Analysis

Two multiple linear regressions were conducted to examine the extent to which online engagement variables predicted mental health and social behavior outcomes among high school students (c.f. Fig. 2). The predictors included purchase behavior, Social Media use, online search activity, and AI tools use.

In the first regression model predicting mental health, the overall model was significant, $F(4, 192) = 6.56, p < .001$, accounting for approximately 12% of the variance in mental health scores, $R^2 = .12$. Among the predictors, AI tools use was a significant positive predictor, $\beta = 2.17, p < .001$, indicating that higher use of AI tools was associated with better mental health outcomes. Purchase behavior showed a marginally significant negative association with mental health, $\beta = -1.07, p = .088$. Neither social media use ($\beta = 0.42, p = .534$) nor online search ($\beta = -0.26, p = .737$) significantly predicted mental health.

In the second regression model predicting social behavior, the model was highly significant, $F(4, 192) = 40.72, p < .001$, explaining 46% of the variance in social behavior scores, $R^2 = .46$. Both AI tools ($\beta = 1.98, p < .001$) and purchase behavior ($\beta = 1.43, p = .001$) were significant positive predictors of social behavior. Online search had a marginally significant effect ($\beta = 0.88, p = .082$), whereas social media use was not a significant predictor ($\beta = -0.06, p = .893$).

These findings suggest that AI tools consistently predict positive outcomes in both psychological

and social domains, while Purchase behavior is more strongly associated with social behavior than mental health. Social media and online search, despite their widespread use, did not emerge as reliable predictors in the presence of other variables.

Regression Scatter Plots

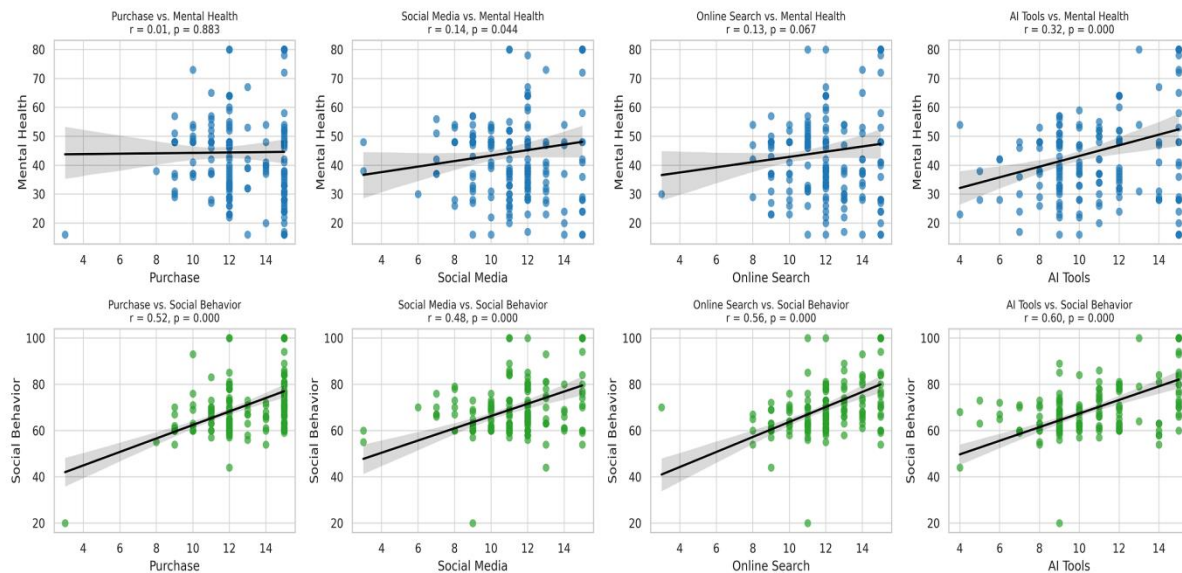


Fig. 2 Regression Scatter Plots

7. Discussion

This study aimed to explore how different aspects of the digital world—like social media, online shopping, search behavior, and AI tools—connect with the mental health and social behaviors of Chinese teenagers. One of the clearest takeaways is how the findings differ from the prior research^[4-6]. While studies in Western settings often report strong links between digital use and issues like anxiety, depression, or stress, this study found those connections to be weak or even absent. In contrast, network use—especially activities involving AI and online shopping—showed a noticeable connection to stronger social behaviors, including empathy, cooperation, and adaptability.

This contrast with previous studies is significant. A number of existing studies suggest that heavy social media use leads to emotional strain or isolation^[6-8]. Yet in this study, Chinese teenagers did not show clear mental health problems tied to their digital habits. One reason could be how platforms are used differently: instead of focusing on social approval, many teens in China turn to apps like Douyin, WeChat, or Rednote for practical needs, school help, or group communication. And in a culture where academics are a central focus, teenagers may spend more time on goal-driven digital tasks rather than emotional expression online.

On the other hand, the study did find a meaningful link between digital engagement and social development. Teenagers who used AI tools or frequently shopped online tended to show stronger collaboration skills, adaptability, and empathy. This may reflect how these platforms are designed. Many AI tools used in China support interactive learning and problem-solving, which encourages teens to work with others. Online shopping, surprisingly, can also involve a lot of peer interaction—sharing reviews, planning purchases together, or discussing trends—all of which build communication and teamwork skills.

What makes these findings compelling is the lack of clear mental health problems tied to digital use and the clear benefits for social skills. It could mean that Chinese teenagers are more emotionally

stable in digital settings or that their online spaces are more filtered or supervised—by parents, schools, or algorithms due to stronger parental supervision, academic-driven online behaviors, and platform regulation policies. Whatever the reason, this shows that how teens interact with the digital world matters just as much as how often they do. It also raises the question of how much emotional impact does not stem from the technology itself, but from how teenagers are taught to use and interpret it. Cultural expectations, school environments, and family norms could all play protective roles that shape healthier digital behaviors.

These results support a more layered way of thinking about teenagers and technology. Rather than seeing all screen time as risky, this study suggests that the kind of engagement—especially when it's interactive, useful, or peer-related—can actually help teens grow. In China, where education, discipline, and responsibility are deeply valued, it's possible that teenagers are naturally drawn to digital behaviors that align with these values.

The findings also offer new insights into how we apply psychological theories. According to the Cognitive Development Theory^[2], teenagers are developing abstract thinking and problem-solving skills—skills that can be strengthened through structured digital tools. Similarly, Social Learning Theory (Bandura, 1977) reminds us how teens learn from peers. If their digital interactions are based on shared tasks or group learning, they may be picking up real social and emotional skills online. The Digital Natives Theory^[3] further explains that teens who grow up surrounded by technology naturally prefer fast-paced, interactive, and multimedia-based learning, making them more adaptive to digital environments that promote collaboration.

From a practical point of view, these results suggest a shift in how we support teenagers in digital spaces. Instead of focusing only on reducing screen time, we should help teens engage with technology in smarter ways. This means guiding them to use tools like AI for learning, take part in group projects online, and join positive communities that match their interests. It also includes helping them build good habits, like setting limits and thinking critically about what they see. Using AI to study, working together on online projects, or joining positive online communities are all ways they can benefit socially. Teaching digital literacy, helping teens set boundaries, and building emotional awareness can also make online life healthier and less overwhelming. For example, schools could implement curriculum-integrated AI assignments to foster collaboration, while parents could guide teens in making responsible online purchasing decisions that enhance critical thinking and peer exchange.

Overall, this study brings a fresh, culturally grounded view to the global conversation on teenagers and tech. It challenges broad assumptions that digital use always leads to harm and instead highlights how culture, purpose, and platform design shape teen experiences. While mental health risks were not strongly tied to digital habits in this group, the positive connections to social behavior suggest that, when used mindfully, the network environment can play a valuable role in helping teenagers grow.

8. Conclusions

This study explored how various aspects of the network environment—social media use, online shopping, online search, and AI tool use—relate to the mental health and social behaviors of Chinese teenagers. The findings revealed weak or inconsistent correlations between digital engagement and mental health indicators such as depression, anxiety, and stress. In contrast, certain types of digital engagement, particularly AI tool use and online shopping, were strongly and positively associated with key social behaviors, including empathy, cooperation, adaptability, and problem-solving.

These findings offer important theoretical implications. They support the Cognitive Development Theory^[2] by showing how structured digital tools can enhance adolescents' abstract thinking and

reasoning abilities. The results also align with the Social Learning Theory^[1], which highlights the role of observation and interaction in behavior development, especially in peer-driven online environments. Applied implications suggest that educators and parents should focus not just on screen time but also on guiding teenagers toward meaningful and socially enriching uses of technology, such as academic AI tools and peer-based online communities.

Future research could build on these findings by using longitudinal designs to examine how patterns of digital use affect teenagers over time. Additionally, qualitative methods such as interviews or focus groups could offer deeper insights into how teenagers perceive their digital experiences. Comparative studies across different cultures or educational systems may also help determine whether these patterns are specific to Chinese adolescents or reflect broader global trends. Overall, the study emphasizes the need for a more nuanced understanding of how digital environments shape youth development.

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