



From Clicks to Calm: Investigating the Link Between Mindfulness and Digital Hoarding Behavior Among Chinese Youth

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Background: Digital hoarding refers to the continuous acquisition of digital content and the difficulty in disposing of it. This behavior is increasingly common among today's youth. This study aims to explore the impact of mindfulness on digital hoarding behavior, investigating self-control as a mediator and upward social comparison via social media as a moderator.

Methods: A total of 956 young individuals participated in this cross-sectional study. The research instruments used included the Mindfulness Measure, the Self-Control Scale, the Social Comparison Scale, and the Digital Hoarding Behavior Questionnaire. Data analysis included descriptive statistics and correlation analysis. For more complex analyses, we examined the mediating role of self-control and the moderating effects of upward social comparison via social media in the relationship between mindfulness and digital hoarding behavior.

Results: 1) Mindfulness significantly negatively predicted digital hoarding. 2) Self-control mediated the relationship between mindfulness and digital hoarding. 3) Upward social comparison via social media moderated the relationship between mindfulness and self-control, specifically the first segment of the mediation pathway.

Discussion: This research is pioneering in exploring mindfulness as a protective factor against digital hoarding, offering fresh insights into this nascent field. The findings also suggest prevention and intervention strategies for digital information management disorder in young people.

Keywords: social media, digital hoarding, mindfulness, self-control, upward social comparison via social media

Introduction

Social media has become an important platform for the production and exchange of digital content, providing users with a convenient way to access, store, and use data resources.¹ However, the rapid growth of social media has fostered poor data management habits, with digital hoarding being a prime example.² Digital hoarding, a subset of hoarding behavior, refers to the continuous acquisition of digital content and an unwillingness to discard it, resulting in stress and clutter.^{3,4} Millions of Americans have inboxes with more than 1000 unread emails, while a significant 60% of the population consistently fails to delete photos or videos from their digital devices.⁵ According to reports, 1074 photos are uploaded to Instagram every second, a total of about 64,440 per minute and nearly 4 million per hour, with an estimated 95 million photos and videos uploaded daily.⁶ Related studies have shown that the unchecked accumulation of redundant digital items reduces information processing efficiency, leading to cognitive failure,⁷ stress, and anxiety.^{3,4} In addition, storing large amounts of digital files on smart devices or in the cloud exposes individuals to risks such as data breaches and cyberattacks.⁸ The emergence of digital hoarding behavior and its potential consequences have attracted the attention of the academic community.^{4,6} Although researchers have endeavored to understand this extreme form of digital obsession from diverse perspectives, there are still several gaps:

First, research on digital hoarding is still in its infancy,⁹ and established studies have not yet isolated the youth demographic for separate, focused study from the broader population. Young people, who are the primary users of social media,¹⁰ engage with these platforms on a daily basis in search of knowledge and job opportunities.¹¹ During this critical life transition,¹² they are particularly vulnerable to external influences (eg, peers) and psychological factors.¹³ Relevant data indicate that in non-clinical samples, the prevalence of pathological digital hoarding behavior ranges from 3.7% to 6% in the general population, while the rate among the young population is significantly higher at 21.5%.¹⁴ This suggests that digital hoarding is increasingly becoming a common behavioral disorder among contemporary youth.¹⁵

Second, while the triggering mechanisms of digital hoarding behavior have been widely explored,¹⁶ few studies have examined the protective factors against this pathological behavior. Investigating these protective factors is crucial for a more comprehensive understanding of the phenomenon and provides theoretical support for the development of effective intervention strategies. A recent exploratory study suggests that mindfulness may help reduce the occurrence of digital hoarding behavior.¹⁷ However, this claim has not yet been sufficiently supported by empirical data. More importantly, the mechanisms through which mindfulness influences digital hoarding remain unclear. According to limited self-control theory, successful self-management relies on self-control resources, which are finite.¹⁸ Mindfulness plays a critical role in replenishing these resources, potentially preventing individuals from engaging in maladaptive behaviors.¹⁹ This means that self-control may serve as a bridging variable between mindfulness and digital hoarding. In other words, including self-control as a mediating variable could help uncover the underlying process through which mindfulness affects digital hoarding.

Third, existing research on digital hoarding behavior has primarily focused on individual factors such as loss aversion,²⁰ fear of missing out (FOMO),^{9,21} and emotional attachment,^{3,22} with relatively little consideration of external environmental factors. In particular, there is a significant lack of attention to the online life scenarios of young people.

The Individual-Environment Interaction theory suggests that an individual's psychology and behavior result from the dynamic interplay between external conditions and personal attributes.²³ This implies that the effects of mindfulness as an individual trait on psychological adjustment may also be influenced by situational factors.¹⁹ Today, social media has become a fundamental infrastructure for individual survival.¹ The "hyperpersonal" space created by social media enables users to strategically employ technology and linguistic symbols to project an enhanced, idealized version of themselves.²⁴ However, constant exposure to others' positive online portrayals creates a highly stressful and complex scenario, namely upward social comparison via social media.²⁵ Research has demonstrated that upward social comparison via social media has profound consequences for one's psychological and behavioral development.²⁶ Accordingly, this study considers upward social comparison via social media as an external disruptive factor, which will help further explore the boundary conditions of mindfulness' impact on digital hoarding.

Literature and Hypothesis Development

Mindfulness and Digital Hoarding Behavior

Mindfulness refers to focusing on the present moment and having an open and accepting attitude toward all experiences that are occurring.²⁷ It includes three key components: present moment awareness, acceptance, and decentering.²⁸ Present moment awareness refers to the self-regulation of attention so that it is maintained on the present moment experience, such as breathing, bodily sensations, or the content of thoughts; acceptance involves adopting a non-judgmental attitude toward one's thoughts, feelings, and physical sensations; and decentering means viewing one's thoughts and feelings as transient events that are separate from oneself. Since individuals naturally possess the capacity for mindfulness, but the tendency to be mindful varies from person to person, mindfulness is also considered a unique individual trait.²⁹

Meta-analyses suggest that mindfulness is associated with a wide range of positive outcomes, including increased psychological well-being,³⁰ improved cognitive levels,²⁷ and reduced psychological distress.³¹ The protective role of mindfulness against problematic Internet behavior has also been well supported both theoretically and empirically.³² The re-perceiving model of mindfulness posits that consciously focusing attention on the present moment can facilitate de-automated, segregated processing of stimuli. This process, known as "reperception", promotes a shift in cognitive style that enhances the flexibility of cognitive-emotional-behavioral responses.²⁸ This means that when individuals encounter

challenging environments or stimuli, mindfulness helps reduce automatic cognitive and emotional responses, thereby decreasing the likelihood of maladaptive behaviors such as digital hoarding. In addition, a recent study found a significant negative correlation between mindfulness and digital hoarding behavior.¹⁷ Based on the above theoretical analysis, Hypothesis 1 was proposed in this study.

Hypothesis 1: Mindfulness can negatively predict digital hoarding behavior.

Self-Control as a Mediator

Self-control refers to an individual's ability to autonomously regulate actions in accordance with personal values and societal norms.³³ It involves the initiation or inhibition of specific behaviors, such as controlling impulses, resisting temptations, and delaying gratification.³⁴

Limited self-control theory posits that effective self-control relies on the resource of self-control.¹⁸ This resource, similar to the muscle strength that facilitates physical activities, is limited over a period of time and fuels various self-regulatory processes.³⁵ Research has demonstrated a strong positive relationship between mindfulness and self-control.³⁶ For instance, from a neurophysiological perspective, Broderick and Jennings found that mindfulness can prevent the depletion of self-control resources, thereby increasing an individual's level of self-control.³⁷ Longitudinal studies have also confirmed that mindfulness practices, whether short-term or long-term, are effective in enhancing self-control.³⁸

Moreover, self-control is often regarded as a critical brake on maladaptive behavior.¹⁹ The General Theory of Crime posits that whether an individual engages in problematic behavior is fundamentally dependent on his or her level of self-control.³⁹ Specifically, individuals with inadequate self-control often exhibit poorer emotional regulation and cognitive performance, are less able to consider the consequences of their actions, and are more likely to engage in deviant or problematic behavior.³⁶ Related research has shown that self-control is a significant negative predictor of compulsive behavior.^{40,41} This means that individuals with strong self-control possess a higher level of cognitive ability that may help them weigh the consequences of hoarding behavior and thus curb the impulse to excessively hoard digital content. However, to our knowledge, no empirical studies have yet examined the relationship between self-control and digital hoarding. Based on the above reasoning, the current study proposed Hypothesis 2.

Hypothesis 2: Self-control acts as a mediator in the relationship between mindfulness and digital hoarding behavior.

Hypothesis 2a: Mindfulness can positively predict self-control.

Hypothesis 2b: Self-control can negatively predict digital hoarding behavior.

Upward Social Comparison via Social Media as a Moderator

Social comparison is a fundamental aspect of social life. People compare themselves to others in order to better understand themselves.⁴² Social media is considered an ideal platform for engaging in social comparison.²⁵ Previous research has found that when social media users browse idealized profiles and search for information, they often compare themselves to others who appear to be in more advantaged situations, a phenomenon known as upward social comparison via social media.⁴³ This situation is particularly common among young adults,⁴⁴ who dedicate substantial time to browsing and gathering information online.

First, social comparison theory suggests that high-intensity comparison scenarios are important factors influencing an individual's self-control and psychosocial adjustment.⁴⁵ For example, recent research has shown that individuals who observe their peers or friends frequently acquiring digital content on social media may experience fear of missing out (FOMO) and loss aversion.⁴⁶ Meta-analyses of upward social comparison also suggest that high levels of social comparison have negative impacts on an individual's self-regulation.⁴⁷

Second, according to the Individual-Environment Interaction theory, an individual's psychology and behavior are shaped by interactions with their surrounding environment.²³ Consequently, an individual's psychological adjustment may also be regulated by environmental factors. In other words, online social media contexts play a significant role in individual development.¹⁹ For example, previous research suggests that the high-pressure environment of social media

can intensify social cognitive processes, increasing adolescents' vulnerability to mental health problems.⁴⁸ Related studies have also shown that environmental challenges, such as social comparison or competition, can weaken the protective influence of positive personal characteristics on an individual's mental health.⁴⁹ That is, although mindfulness aims to facilitate the de-automation of processing stimuli, scenarios of intense social media comparison may exacerbate negative emotions and self-denigration.²⁵ This situation may hinder mindfulness from having a positive impact on self-control, potentially limiting its effectiveness. Based on the above discussion, Hypothesis 3 and Hypothesis 4 of this study were proposed.

Hypothesis 3: Upward social comparison via social media moderates the relationship between mindfulness and self-control.

Hypothesis 4: Upward social comparison via social media moderates the initial segment of the mindfulness-self-control-digital hoarding mediation pathway.

The Current Study

Taken together, this study constructs a moderated mediation model that integrates individual characteristics and environmental factors. The aims of the current study are threefold. First, it examines the relationship between mindfulness and digital hoarding. Second, it tests whether self-control would mediate the relationship between mindfulness and digital hoarding. Third, it explores whether upward social comparison via social media would moderate the indirect relationship between mindfulness and digital hoarding, specifically the initial segment of the mediation pathway through self-control. The moderated mediation model is presented in Figure 1.

Methods

Participants

The population of this study consists of the youth demographic. There is no universal standard for defining the youth population. The World Health Organization defines it as ages 18 to 44, while the Medium- and Long-term Youth Development Plan (2016–2025) issued by the Central Committee of the Communist Party of China and the State Council in 2017 sets the range at 18 to 35. Since this study was conducted in mainland China, we focused on the 18 to 35 age group to align with the local context and research objectives. In the survey, we further divided this age group into three categories: 18–23 years, 24–29 years, and 30–35 years. This classification has been applied and accepted in several studies.^{50,51}

The survey was conducted over three months, from December 9, 2023, to March 9, 2024. Of the 1032 questionnaires collected, 956 were valid, resulting in a response rate of 92.6%. It is generally accepted that the ratio of subjects to number of items should not be less than 5:1, with 10:1 being more appropriate.^{52–54} Therefore, the sample size in this study sufficiently meets the required standard, ensuring the reliability of the research results.

As shown in Table 1, among the respondents, 451 were male, representing 47.2% of the total, while 505 were female, representing 52.8%. In terms of age distribution, 358 respondents were between the ages of 18 and 23, representing

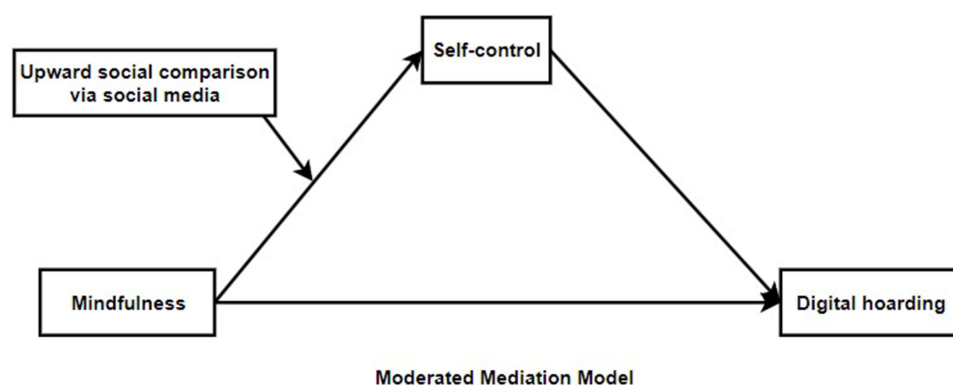


Figure 1 The Hypothesized Moderated Mediation Model.

Table 1 Statistical Table of Basic Information of Effective Samples

Statistical Items	Specific Content	Statistical Value	Percentage
Gender	Male	451	44.2%
	Female	505	55.8%
Age	18–23	358	37.4%
	24–29	458	47.9%
	30–35	140	14.6%
Educational background	Middle school and below	153	16.0%
	High school or vocational school	245	25.6%
	College or Bachelor	372	38.9%
	Master and above	186	19.5%

37.4%; 458 were between 24 and 29 years old, representing 47.9%; and 140 were between 30 and 35 years old, representing 14.6% of the total. The mean age was estimated at 25.13 years using the midpoint of each age group, weighted by the number of respondents. Regarding educational level, 153 participants had an education level of middle school or below, accounting for 16.0%; 245 had completed high school or vocational school, accounting for 25.6%; 372 had a college or bachelor's degree, accounting for 38.9%; and 186 had a master's degree or above, accounting for 19.5% of the total.

Procedure

Prior to formal data collection, we assembled a panel of two psychology professors and two information management experts to conduct a thorough evaluation of each component of the questionnaire. Their feedback indicated that the questionnaire was easy to understand and highly relevant to the research topic. Next, we conducted a pilot study with a sample of 50 participants, all of whom were active users of digital storage platforms. The results showed that the reliability and validity of the questionnaire were at an acceptable level.

During the official survey, we used a convenience sampling technique and utilized the Wenjuanxing survey platform to distribute and manage the questionnaire. In China, many researchers use Wenjuanxing (www.wjx.cn) to conduct user media behavior surveys due to its key advantages: multi-channel distribution, platform compatibility, and anonymous responses for privacy protection, all of which increase participation rates and data authenticity. We distributed the questionnaires online through four social media platforms: Sina Weibo, WeChat, Xiaohongshu, and Zhihu. As China's mainstream social media platforms,⁵⁵ these platforms have a predominantly young user base and share the following common characteristics: 1) a focus on user interaction, allowing users to freely create social networks while keeping up with the digital activities of others; 2) a variety of content types, including news, personal updates, professional articles, videos, and images; 3) the use of algorithmic systems based on users' interests and social circles to deliver content; and 4) most importantly, these platforms provide bookmarking capabilities for collecting content and have interest groups dedicated to digital hoarding, which helped us obtain more targeted and representative samples. In addition, as a complementary approach, we converted the online questionnaire into a QR code and posted it at offline locations to increase the diversity and inclusiveness of our sample.

To ensure that participants were appropriately qualified for the study, we drew from previous research²¹ and included screening questions at the beginning of the questionnaire: "Are you 18–35 years old?" "Are you currently an active member of social media platform?" "Have you bookmarked any social media content in the past two weeks?" If a participant selected "No" for any of these questions, the survey would immediately terminate. Other criteria for filtering out invalid responses included excessively short response times (less than 3 minutes), identical answers throughout the survey, and failure to pass an attention check question (eg, "What is the capital of China?"). All participants signed an online consent form, which clearly stated that their participation was voluntary. After completing the questionnaire, participants were randomly given a small monetary compensation of 1–2 RMB.

Measures

Mindfulness

A commonly used tool for assessing mindfulness is the Child and Adolescent Mindfulness Measure (CAMM), developed by Greco et al.⁵⁶ This one-dimensional scale consists of 10 items, such as “I have trouble focusing on one thing” and “I often think about the past rather than the present”. Each item is rated on a 5-point Likert scale (0 = never, 4 = always). All items on the scale are reverse scored, and an average score is calculated for all items. Higher scores indicate higher level of mindfulness in daily life. The CAMM has been validated across cultures and shows strong reliability and validity with Chinese youths.^{17,57,58} Confirmatory factor analysis results were as follows: $\chi^2/df = 6.48$, RMSEA = 0.08, RMR = 0.04, CFI = 0.93, NFI = 0.92, GFI = 0.95. The Cronbach's α of the scale was 0.85.

Self-Control

The Self-Control Scale (SCS), developed by Tangney et al, is a widely used instrument for measuring levels of self-control.⁵⁹ While the scale provides a comprehensive assessment of self-control, it has certain limitations, such as being time-consuming, potentially leading to response fatigue and bias, and potentially lowering response rates. To address these issues, Morean revised and created a simplified version with 7 items across two dimensions: self-regulation and impulse control.⁶⁰ This version has been translated into several languages, and its reliability and validity have been confirmed across cultures.^{61,62} Sample items include: “I am good at resisting temptation”, “I can work efficiently toward a long-term goal”, and “Sometimes I can't resist doing something even though I know it's wrong”. Items are rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree), with reverse scoring for some items. An average score is calculated across all items, with higher scores indicating greater self-control. Confirmatory factor analysis yielded the following results: $\chi^2/df = 2.72$, RMSEA = 0.04, RMR = 0.02, GFI = 0.97, NFI = 0.97, CFI = 0.96. The Cronbach's α of the scale was 0.89.

Upward Social Comparison via Social Media

We used the Social Comparison Scale developed by Gibbons and Buunk.⁶³ The scale was later translated and revised to assess levels of upward social comparison among social media users.⁶⁴ Numerous studies have demonstrated the high reliability and validity of the scale, making it a widely used tool.^{46,65,66} It consists of six items, such as “On social media platforms, I often compare myself to those who are doing better”, “When things go wrong, I often compare myself to those who are doing well”, and “When assessing social media skills, I often compare myself to others with better skills”. Scoring is based on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree), with the total score being the sum of each item. Higher total scores suggest a greater tendency for social comparison. Confirmatory factor analysis yielded the following results: $\chi^2/df = 4.71$, RMSEA = 0.06, RMR = 0.02, NFI = 0.93, CFI = 0.91, GFI = 0.92. The Cronbach's α of the scale was 0.86.

Digital Hoarding Behavior

Neave et al developed the Digital Behaviors Questionnaire (DBQ) for assessing digital hoarding.⁶⁷ This questionnaire has limitations, notably its emphasis on computer-related office documents and its focus on emotional attachment. Wu et al, later revised it to better fit the social media landscape and Chinese cultural norms.⁶⁸ The scale has been shown to have strong reliability and validity in related studies.^{17,21,46} It comprises 13 items and three second-level factors: “Accumulation”, “Work necessity”, and “Emotional attachment”. “Accumulation”, with 3 items, indicates the tendency to persistently hoard digital files, such as “Keeping files that others might not”. “Work Necessity”, with 4 items, reflects the difficulty of discarding digital files for work-related reasons, such as “Deleting certain files could cause me to forget information”. “Emotional Attachment”, comprising 6 items, highlights the struggle to delete digital files stemming from emotional bonds, such as “Deleting certain files is like losing a friend”. Each item is rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The total score is the sum of each item, with higher scores indicating greater levels of digital hoarding. Confirmatory factor analysis results were as follows: $\chi^2/df = 5.16$, RMSEA = 0.07, RMR = 0.04, CFI = 0.96, NFI = 0.95, GFI = 0.95. The Cronbach's α of the scale was 0.91.

Data Analysis

Data were analyzed with SPSS 26.0. Initially, descriptive statistics and Pearson correlations were used to examine the relationships among mindfulness, self-control, upward social comparison via social media, and digital hoarding behavior.

Subsequently, the mediating role of self-control and the moderating role of upward social comparison via social media were examined using PROCESS Model 4 and Model 7 in the SPSS macro program.⁶⁹ All regression coefficients were tested using the bootstrap method of bias correction and percentile. All variables were standardized prior to formal data processing.

Results

Common Method Biases

Self-reported data may lead to common method bias. To further enhance the scientific rigor of this study, we employed Harman's single-factor test to assess the presence of common method bias.⁷⁰ The results indicated that there were six factors with eigenvalues greater than 1, with the first factor accounting for 30.18% of the variance, which is well below the critical threshold of 50%.^{71–73} This suggests that there is no significant common method bias in the data, thereby ensuring the high credibility of the study's findings.

Correlation Analysis

The normality test results indicate that both skewness and kurtosis fall within acceptable statistical ranges, with absolute values for both measures being less than 2. Kline states that if the absolute values of kurtosis are less than 10 and the absolute values of skewness are less than 3, the data can be considered approximately normally distributed.⁷⁴ These ranges are widely accepted in the statistical literature,^{72,74–76} suggesting that the data is essentially normally distributed and suitable for further analysis.

Table 2 presents the means, standard deviations, and correlation coefficients for the variables. The results revealed significant correlations between mindfulness, self-control, upward social comparison via social media, and digital hoarding. Specifically, mindfulness and self-control were significantly positively correlated ($r = 0.34$, $p < 0.01$), while mindfulness was significantly negatively correlated with both upward social comparison via social media ($r = -0.39$, $p < 0.01$) and digital hoarding ($r = -0.41$, $p < 0.01$). Similarly, self-control was significantly negatively correlated with both upward social comparison via social media ($r = -0.53$, $p < 0.01$) and digital hoarding ($r = -0.56$, $p < 0.01$). Furthermore, upward social comparison via social media was significantly positively correlated with digital hoarding ($r = 0.55$, $p < 0.01$).

Mediation Effect Test

First, using Model 4 (a basic mediation model) from the PROCESS macro in SPSS, we resampled the original sample 5000 times. While controlling for variables such as gender and age, we examined the mediating effect of self-control in the relationship between mindfulness and digital hoarding behavior.

The results of the regression analysis (see Table 3) indicated that mindfulness significantly negatively predicted digital hoarding behavior ($\beta = -0.47$, $p < 0.001$). This validated Hypothesis 1. When the mediating variable was introduced, the negative predictive effect of mindfulness on digital hoarding behavior remained significant ($\beta = -0.29$, $p < 0.001$). Additionally, the positive predictive effect of mindfulness on self-control was significant ($\beta = 0.48$, $p < 0.001$), and the negative predictive effect of self-control on digital hoarding was also significant ($\beta = -0.38$, $p < 0.001$). Hypotheses 2a,2b were thus confirmed.

Furthermore, the upper and lower bounds of the bootstrapped 95% confidence intervals for both the direct effect of mindfulness on digital hoarding and the mediated effect of self-control did not include 0 (see Table 4). This suggests that

Table 2 Descriptive Statistics and Intercorrelations Among Variables

Variables	M	SD	1	2	3	4
1. Mindfulness	2.0	0.64	1			
2. Self-control	2.4	0.90	0.34**	1		
3. Upward social comparison	3.6	0.77	-0.39**	-0.53**	1	
4. Digital hoarding behavior	3.4	0.75	-0.41**	-0.56**	0.55**	1

Note: ** $p < 0.01$.

Table 3 Mediator Variable Model

Regression Equation		Fitness Index			Significance of Regression Coefficients			
Outcome Variables	Predictor Variables	R	R ²	F	β	SE	LLCI	ULCI
Digital hoarding	Gender	0.43	0.19	72.8	-0.15***	0.04	-0.23	-0.06
	Age				0.08**	0.03	0.03	0.14
	Mindfulness				-0.47***	0.03	-0.54	-0.41
Self-control	Gender	0.35	0.12	44.21	0.12*	0.06	0.01	0.23
	Age				-0.004	0.04	-0.08	0.07
	Mindfulness				0.48***	0.04	0.4	0.57
Digital hoarding	Gender	0.62	0.38	145.15	-0.10**	0.04	-0.18	-0.03
	Age				0.08**	0.03	0.03	0.13
	Mindfulness				-0.29***	0.03	-0.35	-0.23
	Self-control				-0.38***	0.02	-0.43	-0.34

Notes: **p < 0.01, ***p < 0.001.

Table 4 Decomposition of Total, Direct and Indirect Effects

Effect Type	Effect	BootSE	BootLLCI	BootULCI
Total effect	-0.48	0.03	-0.54	-0.41
Direct effect	-0.29	0.03	-0.35	-0.23
Indirect effect	-0.19	0.02	-0.24	-0.14

mindfulness not only directly predicts digital hoarding behavior, but also exerts an indirect effect through the mediating role of self-control. The direct effect ($\beta = -0.29$) and the mediated effect ($\beta = -0.19$) accounted for 60.4% and 39.6%, respectively, of the total effect ($\beta = -0.48$), confirming Hypothesis 2.

Moderation Effects Test

Next, Model 7 from the SPSS macro (Model 7 assumes that the first half of the mediation model is moderated, consistent with the theoretical model of this study) was used to test the moderated mediation model while controlling for gender and age.

The results showed that after adding upward social comparison via social media to the model, mindfulness significantly positively predicted self-control ($\beta = 0.22$, $p < 0.001$), whereas upward social comparison via social media significantly negatively predicted self-control ($\beta = -0.51$, $p < 0.001$). Furthermore, the interaction between mindfulness and upward social comparison via social media significantly negatively predicted self-control ($\beta = -0.11$, $p < 0.01$). This suggests that upward social comparison via social media may weaken the positive predictive effect of mindfulness on self-control (see Table 5).

Table 5 Moderated Mediation Model

Regression Equation		Fitness Index			Significance of Regression Coefficients			
Outcome Variables	Predictor Variables	R	R ²	F	β	SE	LLCI	ULCI
Self-control	Gender	0.56	0.31	86.43	0.08	0.05	-0.02	0.18
	Age				0	0.03	-0.07	0.07
	Mindfulness				0.22***	0.05	0.13	0.31
	Upward social comparison				-0.51***	0.04	-0.59	-0.44
	Mindfulness \times Upward social comparison				-0.11**	0.04	-0.17	-0.02

Notes: **p < 0.01, ***p < 0.001.

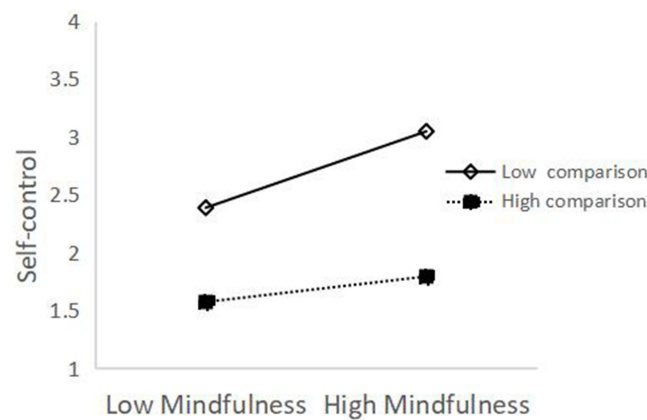


Figure 2 The effect of the two-way interaction between mindfulness and upward social comparison via social media on self-control.

To clarify the moderating effect, upward social comparison via social media was divided into high and low groups based on one standard deviation above and below the mean ($M \pm 1SD$), and a simple slope test was conducted (see Figure 2).

As shown in Figure 2, for individuals with low levels of upward social comparison via social media ($M-1SD$), mindfulness significantly positively predicted self-control ($\beta_{\text{simple}} = 0.30$, $p < 0.001$). For those with high levels of upward social comparison ($M+1SD$), mindfulness still positively predicted self-control, but the effect was notably reduced ($\beta_{\text{simple}} = 0.15$, $p < 0.01$). That is, as the level of upward social comparison via social media increases, the positive influence of mindfulness on self-control tends to decrease (see Table 6). This validated Hypothesis 3.

Overall, the initial pathway through which mindfulness influences digital hoarding behavior via self-control is moderated by situational factors, namely upward social comparison via social media. For individuals with lower levels of upward social comparison via social media, the indirect effect of mindfulness on digital hoarding, mediated by self-control, was larger ($\beta = -0.12$, 95% CI $[-0.17, -0.07]$). For individuals with higher levels of upward social comparison via social media, the indirect effect of mindfulness on digital hoarding, mediated by self-control, was relatively smaller ($\beta = -0.06$, 95% CI $[-0.10, -0.02]$) (see Table 7). This validated Hypothesis 4.

Discussion

The present study established a moderated mediation model to investigate how and when mindfulness affects digital hoarding behavior. Findings revealed that mindfulness not only directly and negatively predicted digital hoarding, but also indirectly influenced it through the self-control pathway. Additionally, upward social comparison via social media significantly moderated the relationship between mindfulness and self-control, which then moderated the initial segment of the mediation pathway.

The Mediating Role of Self-Control

A key discovery of this research is the identification of the self-control mediation pathway. This finding further confirms that self-control is a core mechanism through which positive individual traits suppress digital hoarding behavior, accounting for nearly 40% of the mediation effect.

Table 6 Conditional Effects of the Predictor Considering the Moderator = $M \pm SD$

	Upward Social Comparison	Effect	BootSE	BootLLCI	BootULCI
Direct effect	M-1SD	0.3	0.05	0.2	0.4
	M	0.22	0.04	0.14	0.31
	M+1SD	0.15	0.05	0.05	0.25

Table 7 Conditional Indirect Effects and Index of Moderated Mediation (IMM)

	Upward Social Comparison	Effect	BootLLCI	BootULCI	Index of Moderated Mediation		
					IMM	BootLLCI	BootULCI
Indirect effect	M-1SD	-0.12	-0.17	-0.07	0.04	0.01	0.07
	M	-0.09	-0.13	-0.05			
	M+1SD	-0.06	-0.01	-0.02			

First, the current study found a significant positive correlation between mindfulness and self-control, consistent with previous research. Studies have shown that the awareness and acceptance dimensions of mindfulness can compensate for self-regulatory deficits in Internet use and indirectly mitigate the negative consequences of poor self-control.¹⁹ This finding is supported by limited self-control theory, which suggests that self-control resources are finite.¹⁸ When these resources are drained by other activities, individuals are left in a state of weakened psychological and behavioral control. However, from a positive psychology perspective, mindfulness enhances positive emotional states that directly influence physiological arousal levels, thereby bolstering self-control resources.⁷⁷ Our study reaffirms the importance of mindfulness in enhancing individual self-control.

Second, the results also showed that self-control has a significant negative predictive effect on digital hoarding behavior. This is the first time that such an inference from previous qualitative research has been empirically validated, indicating that the alleviation of digital hoarding may depend on robust self-control.¹⁶ The result is consistent with the dual systems model of impulse and self-control. The dual systems model posits that problematic behaviors associated with low self-control result from an imbalance between the impulsive (emotional) system and the analytical (cognitive) system.⁷⁸ In other words, those with diminished self-control are governed by their impulsive system, prioritizing immediate emotions and the pursuit of instant gratification. Digital hoarding is considered a type of impulse control disorder,⁷⁹ where individuals lacking self-control struggle to make rational decisions when confronted with the overwhelming amount of resources and new content on social media. They satisfy immediate gratification desires or alleviate knowledge-related anxieties through actions such as downloading, saving, or collecting, thus spiraling into a perpetual loop of “hoarding-satisfaction-hoarding”. Conversely, individuals with strong self-control tend to focus on present tasks and are able to make discerning judgments when faced with a variety of digital content. This ability may significantly reduce the likelihood of compulsive hoarding of digital content.

The Moderating Role of Upward Social Comparison via Social Media

The study found that upward social comparison via social media diminishes the beneficial impact of mindfulness. Specifically, the mediating effect of mindfulness on digital hoarding through self-control is moderated by upward social comparison via social media: for individuals experiencing lower levels of upward social comparison, mindfulness can reduce digital hoarding behavior by enhancing self-control. In contrast, for those experiencing higher levels of upward social comparison, this mediating effect is weakened. This may be explained by the following.

First, considering the nature of mindfulness, individuals in a mindful state can better focus on the present moment without comparing themselves to others or worrying about the future.²⁷ However, previous research has shown that upward social comparison via social media tends to increase individuals' selective attention bias toward online stimuli and amplify their inclination to continuously focus on such stimuli.⁸⁰ In other words, the easy access of comparing oneself to others on social media increases the chance that individuals will stray from their original intentions or primary tasks, becoming overly engrossed in observing others' digital engagements. This shift may disrupt the critical process of concentrating and redirecting attention, thereby diminishing the beneficial effects of mindfulness.

Second, the negative emotions resulting from upward social comparison via social media undermine self-control. This result aligns with the theory of depressive social rank, which posits that comparative scenarios can breed a sense of “subordination”, making people feel inferior, anxious, and depressed.^{81,82} Specifically, upward social comparison via social media makes individuals more sensitive to positive online self-presentations of others (eg, digital items that

are liked, bookmarked, and saved), fostering the perception that others have more digital resources. This may heighten feelings of crisis and pressure during social media use. According to limited self-control theory, overcoming negative emotions requires the expenditure of an individual's self-control resources. Therefore, compared to individuals in low-level comparison scenarios, those in high-level comparison scenarios expend more self-control resources, which in turn affects their overall self-control capacity and mental health. This finding also supports previous research suggesting that negative emotions and competitive pressures can be mutually reinforcing, leading individuals to accumulate and hoard digital resources as much as possible to avoid the fear that "peers are doing better, know more, or have more".⁸³

Theoretical Implications

First, as scholars have noted, digital hoarding is a relatively new concept that is still in the early stages of research.^{8,9} In contrast to previous research primarily focused on risk factors, this research takes an innovative approach by exploring protective factors against this maladaptive behavior through the lens of positive individual traits. Based on empirical data, the study found that mindfulness is a significant protective factor against digital hoarding. This finding is therefore highly significant as it is one of the first studies to examine the relationship between mindfulness and digital hoarding, offering potential solutions for mitigating individual digital hoarding behavior. In other words, the results of this study make a valuable contribution to the existing scholarly discourse on digital hoarding by emphasizing the importance of positive individual traits in mitigating this behavior.

Second, utilizing limited self-control theory, this study further identifies the key pathway through which mindfulness influences digital hoarding behavior, specifically through the mediating role of self-control. This suggests that impaired self-control is a proximal factor leading individuals to irrationally collect and retain various digital resources. This finding not only deepens our understanding of digital hoarding behavior but also extends the applicability of limited self-control theory. More importantly, this research enriches the theoretical foundation of the field of digital hoarding and provides new perspectives and directions for future studies on mechanisms and theoretical model development.

Third, traditional research has often treated environmental variables as independent variables, examining the role of mindfulness in the effects of situational factors on individuals.¹⁷ Currently, upward social comparison via social media is increasingly becoming a norm in young people's online lives.⁴⁴ In light of this, the study examines upward social comparison via social media as a moderating variable, focusing on whether the protective role of mindfulness remains robust across different contexts. In other words, our theoretical framework considers both positive individual factors and the negative ones encountered, providing nuanced insights for understanding digital hoarding among youth as a complex phenomenon. The study demonstrates that upward social comparison via social media, as an environmental challenge, undermines the favorable impact of mindfulness on the self-control. This result is supported by the Individual-Environment Interaction Theory and extends previous research. It implies that uncertain competitive situations can create endless imagined rivals, leading individuals to expend more psychological resources, which in turn can result in a loss of behavioral control. Therefore, future efforts should focus not only on mindfulness and building psychological resources but also on addressing the pervasive comparison situation on social media.

Practical Implications

On the one hand, this research underscores the importance of mindfulness-based digital health programs in helping young users defend against the challenges of the digital society. Based on this, we recommend that digital hoarders prioritize fostering mindfulness through innovative methods. For instance, mindfulness apps like Mindfulness Coach are designed to promote mindfulness practice and reduce stress.⁸⁴ Studies have shown that even short-term use of these apps can lead to significant improvements in mental health.⁸⁵ Otherwise, a practice known as "digital mindfulness" is on the rise. Digital mindfulness aims to maintain inner peace and focus by consciously managing one's interactions with digital devices and online content.⁸⁶ Digital hoarders can establish a designated "digital mindfulness time" to intentionally reduce or eliminate the use of electronic devices. During this period, engaging in activities such as meditation, deep breathing, or walking can help cultivate a more self-aware and balanced approach to technology use.⁸⁷

On the other hand, from a design science perspective, social media practitioners should pay closer attention to the dark side of social media. This study found that upward social comparison via social media adversely affects psychological adjustment. Therefore, we recommend that social media platforms consider removing cues that trigger social comparison. For example, prompts such as “X friends are also following” or “X friends saved this article” on WeChat could be eliminated, as these prompts may stimulate unnecessary imitation and comparison. While this may involve commercial interests, our study encourages platforms to find a balance between profit and responsibility. Additionally, social media professionals can optimize the user experience by designing new grouping tools. Research shows that visual bookmarking can improve the efficiency of information management.⁸⁸ Platforms can also set limits on the number and duration of stored items, promoting more effective management of digital resources.

Limitations and Future Direction

Like many studies, this one has its limitations. For example, the self-reported nature of the measures and the cross-sectional design limit the ability to draw causal inferences. Future research could include experimental interventions and longitudinal follow-up to further explore the long-term effects of trait mindfulness on digital hoarding behavior. In addition, the results of this study are based on a limited sample of young people, which limits their generalizability. In the future, researchers should include participants from different age groups and cultural backgrounds to test the cross-group and cross-cultural applicability of the developed framework. Third, this study examined the impact of positive individual characteristics on digital hoarding behavior, focusing solely on mindfulness. Other factors, such as self-efficacy, algorithmic literacy, and psychological resilience, may also be closely related to digital hoarding. Given the limited research on these protective mechanisms, we encourage researchers to consider the combined effects of multiple antecedents on disordered digital information management.

Conclusion

The main findings of this study are: 1) Mindfulness significantly negatively predicts digital hoarding. 2) Self-control mediates the relationship between mindfulness and digital hoarding. 3) Upward social comparison via social media, serving as a situational factor, moderates the relationship between mindfulness and self-control, thereby influencing the initial segment of the mediation pathway. Specifically, higher levels of upward social comparison via social media weaken the positive effect of mindfulness on self-control. In contrast, lower levels of upward social comparison via social media are less likely to induce negative states, making the positive effect of mindfulness on self-control more pronounced. These findings offer valuable insights into the protective role of mindfulness against digital hoarding and suggest strategies for the prevention and intervention of problematic social media use among youth.

Data Sharing Statement

The data that support the findings of this study are available on request from the corresponding author.

Ethics Statement

Studies involving human participants were reviewed and approved by the Research Ethics Committee of Shenzhen University. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the Helsinki Declaration of 1964 and its subsequent amendments. The participant confirmed and provided online informed consent to participate in this study.

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