# Reliability and validity of the Chinese version of the doomscrolling scale and the mediating role of doomscrolling in the bidirectional relationship between insomnia and depression

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## Abstract

**Background** Doomscrolling behavior is very common among college students. The purpose of this study was to evaluate the reliability and validity of the Chinese version of the Doomscrolling Scale, thus providing a scientific basis for its application among Chinese university students.

**Methods** The Chinese version of Doomscrolling Scale was developed through translation and revision of the original scale, conducting item and factor analysis, and validating it with validation factor analysis. The psychometric properties of the Doomscrolling Scale were assessed in 2885 Chinese university students.

**Results** The internal consistency coefficients, two-month test-retest reliability, and split-half reliability of the Chinese version of the Doomscrolling Scale (including the 15-item and the 4-item short version) were high, and the mono-factorial scales fitted well to the theoretical model. Scores on the Chinese version of the Doomscrolling Scale were significantly associated with depression, anxiety, and smartphone addiction. The structural equation model indicates that doomscrolling can mediate the bidirectional relationship between insomnia disorder and depression.

**Conclusions** The revised Chinese version of the Doomscrolling Scale is valid and reliable, which can facilitate research in this field. The association between doomscrolling and various mental disorders has been confirmed, and further research should be conducted to investigate its mechanisms of action.

**Keywords** Doomscrolling, Social media usage, Depression, Anxiety, Smartphone addiction

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## Introduction

The term "doomscrolling" first emerged in 2018 and was popularized by journalist Karen Ho [1]. It refers to a behavior observed in individuals who engage in continuous scrolling through social media news, fixating on distressing, depressing, or other negative information [2]. The act of consistently exposing oneself to negative news on social media and news feeds has been conceptualized as "doomscrolling". This behavior is often defined as a habit, characterized by compulsively scrolling through social media and news updates, with users becoming obsessed with seeking out disheartening negative information [3]. Sharma et al. defined "doomscrolling" as the habitual and immersive scanning of timely negative information in social media news feeds [4]. From the aforementioned conceptualization, it is apparent that doomscrolling leads to a vicious cycle that drives individuals to compulsively consume negative information. Regardless of the severity of these negative stimuli, individuals eventually fall into an endless pattern of seeking negative information, consequently impacting their mental and physical health [5, 6].

In an era where social media news is ubiquitous, excessive consumption of negative information can lead to psychological and behavioral issues such as depression, anxiety, and addiction. Prior research conducted on 747 social media users revealed that engaging in doomscrolling produces a sense of addictive excitement [7], which is posited to be a primary driver of doomscrolling behavior. In terms of negative consequences, studies have found that high frequency of doomscrolling is associated with greater severity of depression, increased anxiety about the future, reduced psychological well-being, and lower life satisfaction [7]. Research has shown that consuming only 15 min of a news program can increase state anxiety and mood dysregulation in college students [8]. Furthermore, individuals who engage with higher-intensity negative news are more likely to exhibit maladaptive behaviors [7]. Specifically, doomscrolling is associated with higher impulsivity, greater stimulus-seeking behavior, and lower motivation to avoid unhealthy behaviors. Additionally, consuming negative news similarly has an impact on individual behavior. Specifically, consuming negative news is linked to negative emotions, reduced prosocial behavior [9], decreased prosocial intentions [10], and lower self-control [4].

A significant external factor contributing to the development of doomscrolling is the personalized information delivery implemented by various news media and social platforms based on user preferences (i.e., The more negative information one reads, the more negative content related apps will push) [11]. This undoubtedly amplifies the exposure to negative information for individuals. Therefore, screening for negative information consumption holds critical significance in the prevention and intervention of adverse behaviors and psychological issues.

Sharma and colleagues developed a self-report measurement tool for doomscrolling [4], aiding researchers in exploring the relationships between doomscrolling and other psychological health variables. This unidimensional scale comprises 15 items (e.g., "I feel an impulse to seek bad news on social media, and it is becoming more frequent"), scored on a 7-point Likert scale, where 1 indicates "strongly disagree" and 7 indicates "strongly agree". The sum of all items' scores reflects the extent of an individual's inclination toward consuming negative information, offering an accessible and comprehensible measurement approach.

Doomscrolling is a relatively novel concept that has been studied by only a few researchers. For instance, the reliability and validity of the Doomscrolling Scale were validated among individuals in Turkey [5]. However, there is currently a lack of research on negative information consumption and effective measurement tools in China. Compared to primary and secondary school students, college students in China have more leisure time and a higher level of autonomous consumption capability. Consequently, they tend to use smartphones more extensively [12], potentially increasing their exposure to negative information through social media feeds. Therefore, this study aims to revise the Doomscrolling Scale and examine its applicability among Chinese university students, thereby providing a reliable tool for investigating negative information consumption. In addition, because of the relationship between doomscrolling and insomnia and depression, we also explored the mediating role of doomscrolling in the bidirectional relationship between insomnia and depression through structural equation modeling.

## Study one

The research focused on the validation of a doomscrolling questionnaire among the Chinese population. Based on the original scale, item analysis, exploratory and confirmatory factor analysis, and reliability analysis were conducted for both the 15-item and 4-item short versions of the questionnaire. Correlation analysis with the criterion-related questionnaire was also performed.

## Methods

### Ethical statement

The study procedure was submitted to the Ethics Committee of the Chongqing Key Laboratory of Psychological Diagnosis and Educational Technology for Children with Special Needs for ethical approval. The submitted materials included the research design, questionnaire content, data collection methods, informed consent

forms, participant recruitment procedures, and potential risk assessments. The Ethics Committee evaluated the ethicality, safety, and scientific validity of the study and eventually granted ethics approval (Ethics Number: CSTJ-RE-20230620004). Additionally, the study was conducted anonymously, and the data were securely stored by designated personnel to fully protect the privacy of the participants and enhance the reliability of the results. As a token of appreciation, participants were entered into a draw with a 1/10 chance of winning 1 RMB upon completing the questionnaire.

### Survey procedure and participants

On June 26 and 27, 2023, an initial survey was conducted among college students from two tertiary institutions in Chongqing, China using a convenient sampling method. A total of 2938 college students participated in this survey. The survey questionnaire was presented and data were collected through quick response (QR) codes generated by the Wenjuanxing platform (www.wjx.cn). The survey was administered by the mental health centers of the university. The survey QR codes were distributed to class advisors by the research team, who then forwarded them to class WeChat groups. Participants scanned the QR codes to take part in the survey. Prior to beginning the survey, participants were presented with the purpose of the study and provided informed consent. Choosing to answer the questionnaire implied their consent to participate. The inclusion criteria were: (1) college or university students currently enrolled in a specialized or undergraduate program; (2) an age of 18 years or older; (3) being capable of using internet tools such as mobile phones or computers. The study did not set explicit exclusion criteria, but during data analysis, responses from participants who took too short a time to complete the questionnaire were excluded.

The survey was conducted online, and all questions were set as mandatory, minimizing the occurrence of missing data. For the sake of survey reliability, participants who completed the questionnaire in less than 120 s were excluded, given that completing the questionnaire within such a short timeframe might lead to careless responses. The time threshold was determined based on the number of items and the average fastest completion time by researchers familiar with the questionnaire content. Additionally, we ensured that the proportion of excluded data was less than 5% of the total data, which is considered not to affect the sample's representativeness [13]. Additionally, since age was an open-ended question, participants who provided incorrect information were also excluded. Finally, 53 participants (1.80%) were excluded, resulting in a final analysis with data from 2885 college students, with 598 participants in Sample 1 and 2287 participants in Sample 2. The effective response rate was 98.2%. The participants ranged in age from 18 to 23 (M=19.36, SD=0.93), and 1726 of them (59.83%) were male.

On August 24, 2023, a retest was conducted using the same procedures and methods as the initial test, involving 1251 participants. A total of 1251 sets of data were collected in Sample 3. A total of 48 questionnaires (3.84%) were excluded from the analysis due to a low response time of less than 50 s for 24 items. The specific exclusion criteria were consistent with that of the initial test. Ultimately, 1203 questionnaires were included for analysis, with an effective response rate of 96.16%. The average age of the participants was 19.46 (SD=0.88), and 607 of them were male.

### Measurement tools

#### *Doomscrolling scale*

The Doomscrolling Scale, developed by Sharma et al. in 2022, was employed for assessment [4]. This scale comprises 15 items (e.g., "I feel an urge to seek bad news on social media, more and more often"), rated on a 7-point Likert scale, where 1 indicates "strongly disagree" and 7 indicates "strongly agree". Higher scores on the questionnaire indicate a stronger inclination toward doomscrolling. The internal consistency coefficients for the original study and this study were 0.960 and 0.982, respectively. Two experts in psychology and English, and one expert in public management and English, were invited to translate the Doomscrolling Scale, producing the initial Chinese draft. Subsequently, the Chinese version was back-translated into English and checked by native English speakers, revealing no significant discrepancies. In this way, the Chinese version of Doomscrolling Scale was developed. For a more comprehensive understanding of the translation process, please refer to the supplementary materials.

#### *Depressive symptoms*

The Patient Health Questionnaire (PHQ-9), based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) diagnostic criteria, consists of 9 items [14]. This self-report questionnaire employs a four-point Likert scale ranging from 0 to 3 for each item, with a total score between 0 and 27. A higher total score corresponds to a more severe level of depression. The internal consistency coefficients for the original study and this study were 0.890 and 0.904, respectively.

#### *Anxiety symptoms*

Generalized Anxiety Disorder (GAD-7) Scale for Measuring Anxiety Levels in university students [15]. The GAD-7 consists of 7 items and is a self-report questionnaire. Each item is rated on a Likert four-point scale ranging from 0 to 3, with a total score ranging from 0 to 21. A higher total score indicates a higher level of anxiety.

The internal consistency coefficients for the original study and this study were 0.920 and 0.939, respectively.

### Smartphone addiction questionnaire

A simplified version of the Smartphone Addiction Scale (SAS-SV) was employed for measuring smartphone usage [16]. The SAS-SV is a unidimensional self-report questionnaire comprising 10 items. It employs a 6-point Likert scale (1 indicating "strongly disagree" and 6 indicating "strongly agree"). The internal consistency coefficients for the original study and this study were 0.967 and 0.932, respectively.

### Data analysis

We performed statistical analyses using SPSS version 26.0 and Amos version 21.0. We conducted a series of exploratory factor analyses (EFA), a multivariate statistical analysis method used to explore potential relationships between variables. Factor analysis reveals the intrinsic structure among variables and simplifies the data by reducing its dimensionality [17]. Confirmatory factor analysis (CFA) was used to test whether the

**Table 1** The demographic characteristics of the participants

| Variables | Study 1 (*N* = 2885) | Study 2 (*N* = 578) |
|---|---|---|
|  | *n* (%) / M(SD) | *n* (%) / M(SD) |
| **Gender** | | |
| Male | 1726 (59.83) | 361 (62.46) |
| Female | 1137 (39.41) | 217 (37.54) |
| Other | 22 (0.76) | / |
| **Age (years) *** | 19.36 (*0.91*) | 19.41 (*0.95*) |
| **Grade** | | |
| Freshman | 2296 (79.58) | 448 (77.51) |
| Sophomore | 548 (18.99) | 84 (20.42) |
| Junior | 37 (1.28) | 96 (1.90) |
| Senior | 4 (0.14) | 1 (0.17) |
| **Census Register** | | |
| Rural areas | 2046 (70.92) | 398 (68.86) |
| Town | 404 (14.00) | 84 (14.53) |
| Urban | 435 (15.08) | 96 (16.61) |
| **Economic Status** | | |
| Very good | 41 (1.42) | 8 (1.38) |
| Good | 136 (4.71) | 23 (3.98) |
| Fair | 1807 (62.63) | 368 (63.67) |
| Poor | 735 (25.48) | 145 (25.09) |
| Very poor | 166 (5.75) | 34 (5.88) |
| **Time Spent Using Smartphones (hour)** | | |
| >2 | 265 (9.19) | 66 (11.42) |
| 2–4 | 925 (32.26) | 168 (29.06) |
| <4 | 1695 (58.75) | 344 (59.52) |
| **Depression (PHQ-9 scores)** | | |
| ≥5 | 1325 (45.93) | 268 (48.10) |
| ≥10 | 356 (12.34) | 80 (13.84) |

*: Mean and standard deviation

M: Mean; SD: standard deviation

current data fits the structural model from the EFA and the original scale. CFA assesses the reliability of the theoretical model by comparing the fit between the observed data and the theoretical model [18]. CFA was conducted using maximum likelihood estimation, and the dimensions were derived from EFA (with only one dimension) from AMOS Graphics. The structural validity of the Chinese version of Doomscrolling Scale was assessed. Indices such as Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Incremental Fit Index (IFI), and Standardized Root Mean Square Residual (SRMR) were used to assess model fit. Fit standards were adopted as follows: RMSEA ≤ 0.08, SRMR ≤ 0.08, CFI ≥ 0.90, TLI ≥ 0.90, and item loadings > 0.60, in accordance with criteria established by Bowman and Goodboy [19]. If the results of the CFA did not meet these fit standards, revisions were planned for items with substantial residual values. Finally, the revised Chinese version of the 15-item Doomscrolling Scale and the 4-item short version of the Doomscrolling Scale were subjected to correlation analysis with depression, anxiety, and smartphone addiction. The detailed steps of the analysis were as follows.

Initially, reliability testing and item analysis were conducted on the collected sample 1. The critical ratio method, total score correlation method, and reliability tests were employed for item selection. The unidimensional structure of the 15-item and 4-item Doomscrolling Scale were validated using exploratory and validation factor analyses. Then, convergent validity was established with reference to the Patient Health Questionnaire-9 (PHQ-9), Generalized Anxiety Disorder-7 (GAD-7), and Smartphone Addiction Scale-Short Version (SAS-SV). The reliability of this questionnaire was assessed using Cronbach's α, McDonald's omega (ω), test-retest reliability, and split-half reliability.

### Results

Table 1 presents the demographic information of the participants. The majority of participants were freshmen and sophomores, accounting for 79.58% and 18.99% of the total, respectively. Over 70% of the participants were from rural areas, and only 15.08% reported urban household registration. The vast majority of participants reported a medium or low economic status, with 62.63% of participants indicating a medium economic status. More than 32.26% of participants used their smartphones for 2–4 h per day, and 58.75% used them for more than 4 h. Nearly half of the participants (45.93%) reported mild or higher levels of depressive symptoms.

### Chinese version of the 15-item doomscrolling scale

Correlation analyses of Doomscrolling Scale scores for each item and the total scores showed correlation

coefficients ranging from 0.793 to 0.936. Effective items were screened according to the critical ratio (CR). Participants with the top 27% of total scores were grouped as the high-score group, and those with the bottom 27% were grouped as the low-score group. An independent samples t-test was then conducted to identify items that could not effectively differentiate participant responses, and these items were removed to improve the reliability and validity of the scale [20]. Independent sample t-tests were conducted to compare the scores of these two groups on each item. The results revealed significant differences across all items between the high- and low-score groups ($p < 0.001$), indicating good discriminant validity.

The EFA results showed a Kaiser-Meyer-Olkin (KMO) value of 0.964 and a significant Bartlett's test of sphericity ($p < 0.05$), suggesting the suitability of the data for factor analysis. Hence, employing maximum variance rotation, a single common factor was extracted based on eigenvalues > 1, contributing to a cumulative variance of 78.11%. Factor loadings ranged from 0.784 to 0.939, indicating a well-structured scale. Factor loadings, descriptive statistics, and item-total score correlations are presented in Table 2. CFA was conducted to assess the model fit of the Chinese version of the 15-item Doomscrolling Scale. The items were fit into a single factor, with the model fit indices yielding $\chi^2/df = 40.685$, RMSEA = 0.132, SRMR = 0.034, CFI = 0.930, TLI = 0.918, and IFI = 0.930. Although there was substantial item intercorrelation, omitting items did not improve model fit. Consequently, modification indices were examined, and 13 residual covariances were added to the model (between items 1 and 2, 1 and 3, 2 and 3, 4 and 5, 5 and 6, 6 and 7, 8 and 9, 9 and 10, 12 and 13, 12 and 15, 13 and 14, 13 and 15, 14 and 15), resulting in improved fit indices: $\chi^2/df = 14.911$, RMSEA = 0.078,

SRMR = 0.019, CFI = 0.979, TLI = 0.971, and IFI = 0.979. All these indices met acceptable model fit criteria.

We made adjustments to some of the paths, item 1: I feel an urge to seek bad news on social media, more and more often, item 2: I lose track of time when I read bad news on social media. Both items explore an individual's behavioral tendencies and emotional responses on social media, as well as their perception of time spent on social media. However, the two differ in their temporal responses, with item 1 focusing on the frequency of social media use, whereas item 2 focusing on the duration of social media use. Items 1 and 3 exhibit significant covariation, as both pertain to the use of social media push notifications, with item 1 displaying particularly high covariation. But item 1 emphasizes an increase in usage frequency, while item 2 emphasizes the behavior of constantly refreshing; items 6 and 7 both pertain to negative emotions individuals experience online, such as feelings of anxiety and panic, but there are differences in the intensity of the reactions. The other revised paths also have high commonalities in some aspects between each other. Therefore, it is necessary to modify these paths to improve the fit and ensure they align with the data's structure and relationships. Consistent with the original scale study, the corrected residuals were predominantly from adjacent items, possibly due to the presentation order rather than unincorporated multidimensionality [4].

The Chinese version of the 15-item Doomscrolling Scale exhibited significant positive correlations with the PHQ-9, GAD-7, and SAS-SV. The total score of the Chinese version of the 15-item Doomscrolling Scale was more strongly correlated with smartphone addiction scores than with depression and anxiety scores (Table 3). The revised Chinese version of the 15-item

**Table 2** Factor loadings, descriptive statistics, and item-total correlations of the doomscrolling scale ($n = 598$)

| Item | Factor loadings | Mean | SD | Item-total correlations |
|---|---|---|---|---|
| 1. I feel an urge to seek… | 0.807 | 2.18 | 1.301 | 0.813** |
| 2. I lose track of time… | 0.784 | 2.37 | 1.356 | 0.793** |
| 3. I constantly refresh… | 0.800 | 2.39 | 1.385 | 0.807** |
| 4. I stay up late at… | 0.874 | 2.14 | 1.296 | 0.876** |
| 5. Reading negative news… | 0.881 | 2.22 | 1.310 | 0.884** |
| 6. When I am online… | 0.888 | 2.19 | 1.316 | 0.890** |
| 7. I constantly feel panicked… | 0.874 | 2.14 | 1.299 | 0.874** |
| 8. I unconsciously check… | 0.924 | 2.14 | 1.301 | 0.921** |
| 9. Even if my newsfeed… | 0.939 | 2.12 | 1.305 | 0.936** |
| 10. I find myself continuously… | 0.930 | 2.10 | 1.286 | 0.927** |
| 11. I check social media… | 0.906 | 2.18 | 1.334 | 0.903** |
| 12. I feel like I am… | 0.919 | 2.07 | 1.294 | 0.914** |
| 13. My social media… | 0.925 | 2.10 | 1.308 | 0.920** |
| 14. I am terrified by… | 0.891 | 2.10 | 1.281 | 0.887** |
| 15. It's difficult to stop… | 0.896 | 2.11 | 1.299 | 0.893 ** |

*Note* **$P < 0.01$

**Table 3** Correlation analysis results between DS15 and DS4 total scores and calibration standards

|  | DS 15 total score | DS 4 total score | PHQ-9 | GAD-7 |
|---|---|---|---|---|
| DS 15 total score | 1 |  |  |  |
| DS 4 total score | 0.968** | 1 |  |  |
| PHQ-9 | 0.346** | 0.350** | 1 |  |
| GAD-7 | 0.370** | 0.377** | 0.800** | 1 |
| SAS-SV | 0.450** | 0.464** | 0.387** | 0.361** |

*Note DS15 (DS4) indicates doomscrolling scale 15-item (4-item); **P < 0.01*

**Table 4** The results of the confirmatory factor analysis (*n* = 2287)

| Fit index | Initial model | Modified model |
|---|---|---|
| $\chi^2$ | 549.358 | 5.204 |
| *df* | 2 | 1 |
| $\chi^2$/*df* | 274.679 | 5.204 |
| RMSEA | 0.346 | 0.043 |
| SRMR | 0.056 | 0.002 |
| CFI | 0.929 | 0.999 |
| TLI | 0.786 | 0.997 |
| IFI | 0.929 | 0.999 |

*Note $\chi^2$/df = Chi Square Degree of freedom Ratio, RMSEA = Root Mean Square Error of Approximation, SRMR = Standardized Root Mean Square Residual, CFI = Comparative Fit Index, TLI = Tucker-Lewis Index, IFI = Incremental Fit Index*

Doomscrolling Scale demonstrated internal consistency (Cronbach's alpha) of 0.98, McDonald's omega (ω) of 0.98, test-retest reliability of 0.98, and split-half reliability of 0.94.

### Chinese version of the 4-item brief doomscrolling scale

The EFA results for the 4-item Brief Scale showed a KMO value of 0.736 and a significant Bartlett's test of sphericity ($p < 0.05$), confirming suitability for factor analysis. A single common factor was extracted in the factor analysis, contributing to a cumulative variance of 79.11%. All items had factor loadings > 0.6, indicating good structural validity.

CFA was conducted for the brief Doomscrolling Scale. The initial model fit indices did not meet the fit criteria, prompting model modification. The results of the revised model and related fit indices are presented in Table 4. Given that each item loaded on a single factor, although with substantial contributions, and considering the strong intercorrelation between items, adjustments were made for large residual values between items 1 and 2. The modified model yielded primary fit indices of $\chi^2$/*df* = 5.204, RMSEA = 0.043, SRMR = 0.002, CFI = 0.999, TLI = 0.997, and IFI = 0.999, all meeting acceptable model fit criteria. The improved model fit indicated good structural validity.

The 4-item brief Doomscrolling Scale demonstrated significant positive correlations (Table 3) with PHQ-9, GAD-7, and SAS-SV. The internal consistency of the short version of the 4-item Doomscrolling Scale was 0.91, the McDonald's omega (ω) was 0.95, test-retest reliability was 0.97, and split-half reliability was 0.83.

### Study two

After confirming the validity of the Doomscrolling Scale among the Chinese population, we further explored the mediating role of doomscrolling behavior in the bidirectional relationship between insomnia disorder and depression. This aims to enhance our understanding of the relationship between insomnia disorder and depression.

### Participants

Study 2 comprised 578 college students recruited following the same procedure as Study 1. The sample consisted of 361 male students and 217 female students, with a mean age of 19.52 (SD = 1.06) years, ranging from 18 to 23 years. The average score for depression was 4.89 (SD = 4.73), and the average score for insomnia disorder was 0.79 (SD = 0.83).

### Measurements

Insomnia disorder was assessed using sleep condition indicators [21], with the online version of the scale comprising 7 items. Each item is scored on a Likert scale of 0–4 points. Scores ranging from 0 to 2 indicate no clinical diagnosis of insomnia, while scores greater than 2 are considered indicative of clinical insomnia disorder. Higher total scores in this study indicate poorer sleep [21]. The internal consistency coefficients of the sleep condition indicators in the original study and this study were 0.857 and 0.889, respectively. Assessment of depressive symptoms was conducted using the PHQ-9, with relevant scale information referenced in Study 1.

### Data analysis

First, Spearman correlation analysis was used to explore the correlation between insomnia disorder, depression, and doomscrolling. Subsequently, the Mplus 8.3 software was used for structural equation modeling (SEM) and analysis. SEM is a multivariate data analysis method used to explore complex relationships between hypothesized structures and indicators [22]. This method is typically used to explain hypothesized causal relationships between latent variables. In a structural model, the relationships between variables are usually represented by diagrams with arrows, which indicate the predictive and predicted relationships, and provide the magnitude of these hypothesized effects [23]. This method is suitable for exploring the bidirectional predictive relationship between depression and insomnia disorders, which may be mediated by doomscrolling behavior. Maximum likelihood estimation and 5000 bootstrap samples were
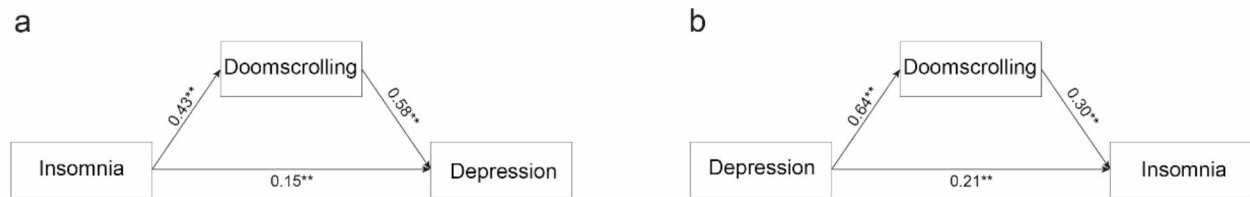
**Fig. 1** Mediation models for insomnia disorder and depression indicators via doomscrolling (**a**. doomscrolling mediates insomnia and depression; **b**. doomscrolling mediates depression and insomnia)

**Table 5** The two-way mediation model effect of insomnia disorder and depression

| Path | Effect | Standard error | 95% confidence interval | |
|---|---|---|---|---|
| | | | Lower limit | Upper limit |
| **Insomnia as an independent variable** | | | | |
| Insomnia→Doomscrolling→Depression | 0.25 | 0.029 | 0.199 | 0.313 |
| Insomnia→Depression | 0.15 | 0.043 | 0.063 | 0.231 |
| The total indirect effect value | 0.40 | 0.044 | 0.311 | 0.485 |
| **Depression as an independent variable** | | | | |
| Depression→Doomscrolling→Insomnia | 0.19 | 0.044 | 0.113 | 0.280 |
| Depression→Insomnia | 0.21 | 0.065 | 0.079 | 0.330 |
| The total indirect effect value | 0.40 | 0.042 | 0.311 | 0.485 |

employed for model estimation. Two mediation models were constructed separately with insomnia and depression as independent variables.

## Results

The distribution of participants' demographic information was similar to that in Study 1 (Table 1). The correlation analysis revealed a significant positive correlation between doomscrolling and insomnia disorder ($r=-0.47$, $p<0.01$), as well as a significant positive correlation with depression ($r=-0.42$, $p<0.01$). The insomnia-depression mediation model showed that doomscrolling mediated the relationship between insomnia disorder and depression in a saturated model, with all path coefficients being significant (Fig. 1a). In the insomnia-depression model, the total effect of insomnia disorder on depressive symptoms was 0.40, with a mediation effect of 0.25, accounting for 62.5% of the total effect. This indicated that 62.5% of the influence of insomnia disorder on depressive symptoms is mediated by doomscrolling (Table 5). The mediation model of depression and insomnia is also a saturated model, with all paths being significant (Fig. 1b). The total effect value of the model was 0.40, with a direct effect from depression to insomnia of 0.21 and a mediation effect of 0.19. The mediation effect accounted for 47.5% of the total effect (Table 5).

## Discussion

Self-reports from news and social media users indicated that doomscrolling was characterized by individuals compulsively showing interest in timely and negative information, often accompanied with anxiety, leading them to be immersed in large volumes of negative news for extended periods [3, 24]. Consequently, we believe that excessive attention to and continued consumption of negative news may increase individuals' fears and uncertainties about the future, exacerbating depression and anxiety among viewers [25, 26]. Therefore, it is crucial to investigate populations inclined towards doomscrolling. This study involved the adaptation of the Doomscrolling Scale developed by Sharma et al. into a Chinese version, providing an effective measurement tool tailored to the doomscrolling behavior of Chinese university students, thereby facilitating research on doomscrolling behavior in China.

EFA revealed that the Chinese version of Doomscrolling Scale was unidimensional, consistent with the one-dimensional structure of the original scale [4]. CFA results indicated that the fit indices RMSEA for both the 15-item and the abbreviated 4-item Chinese versions of the scale were above the recommended standards before modification [27]. Therefore, a similar approach to previous research was adopted to modify the fit model of the scale, achieving acceptable standards [4]. One possible reason for the elevated RMSEA values could be that both the revised Chinese version and the original scale were unidimensional. Some studies argued that traditional cutoff values may not necessarily apply to fit standards for single-factor models, as fit indices have different sensitivities to missing cross-loadings and factor covariates in single-factor models. Thus, the appropriateness of using these cutoff values in single-factor models remains uncertain [28]. Based on other good model fit indices, such as SRMR and CFI, we considered the model fit in

the current study to be acceptable, as the RMSEA index was also not considered in the Turkish revision of Doomscrolling Scale [5].

A comparative analysis with the original study showed that the internal consistency reliability of the Chinese version was 0.98, slightly higher than that of the original scale (0.96), with both versions' internal consistency coefficients exceeding the preferably acceptable value of 0.8 [29]. Additionally, the test-retest reliability of the Chinese version was 0.98, which was not mentioned in the original scale but the reliability was similar. In terms of construct validity, the results for RMSEA, SRMR, and CFI indicators are consistent (supplementary material table S1), but the chi-square to degrees of freedom ratio (Chinese version: 14.911 vs. original version: 4.167) was higher than that of the original study, likely due to the large sample size in this study [30]. These findings support the reliability and validity of the Chinese version of Doomscrolling Scale, ensuring that the translated version is equivalent to the original English version and that the findings are reliable across different language contexts.

Correlation analysis revealed a significant correlation between Doomscrolling scores and depression, anxiety, and smartphone addiction. Research has unveiled a relationship between social media usage and increased depressive and anxious emotions [31], i.e., individuals engaging in more doomscrolling were more likely to experience psychological distress [5]. Negative news followers exhibited compulsive behavior in consuming adverse information, making them more prone to mental health issues such as depression and anxiety [32], and this browsing behavior may also be related to smartphone usage. Correlational validity analysis of the Chinese version of the 15-item Doomscrolling Scale and the abbreviated 4-item version showed that their total scores were higher in correlation with smartphone addiction scores than with depression and anxiety scores. This suggests that individuals addicted to smartphones may find it challenging to break free from the compulsion to browse negative information, as addiction can lead to problematic usage of social media platforms and the internet [5]. However, smartphone addiction is prevalent among Chinese university students [33], which may increase the risk of doomscrolling behavior among individuals. Research suggests that the widespread availability of highly functional modules in smartphones among Chinese university students is a significant factor contributing to smartphone addiction [34]. The powerful features of smartphones can inundate users with various types of information, and the push of negative news may be a critical contributing factor for the frequent co-occurrence of depression [35] and anxiety [36] among smartphone addicts. This important topic warrants further exploration in the future.

However, despite the potential risks associated with the doomscrolling behavior, there is currently little government attention given to this issue. In China, the use of social media among university students has become quite common [37], and there are instances of excessive usage of platforms such as Douyin [38], Weibo [39], WeChat [40], and Bilibili. Without exception, these platforms analyze individuals' browsing preferences and habits to push targeted content [11], which is one of the external factors leading to their excessive use of media software. However, this has garnered little attention from relevant authorities. We believe that if individuals with doomscrolling behavior continue to be exposed to more negative news in the long term, their doomscrolling behavior may be further exacerbated, thereby causing or worsening mental health issues. Therefore, we urge stakeholders to prioritize this important issue.

Revising the Chinese version of Doomscrolling Scale holds significant practical importance. Firstly, this measurement scale empowers researchers to assess individuals' engagement in doomscrolling. Research has convincingly established a strong link between social media addiction and generalized problematic internet use, suggesting that doomscrolling represents an excessive and potentially dysfunctional facet of social media behavior [4]. Consequently, quantifying the doomscrolling behavior enables researchers to investigate it alongside other problematic behaviors. Secondly, increased awareness of doomscrolling behaviors can be beneficial for users, as it encourages the adoption of self-regulation strategies and alternative approaches to curbing excessive exposure to negative media. For example, users may learn to consume mobile news in smaller, deliberate portions [41]. Lastly, concerning the management of the current Chinese university students, utilizing this scale for assessment can inform decision-makers about the prevalence of negative information consumption and excessive social media use. Armed with this knowledge, it can assist mental health professionals in better identifying high-risk groups and implementing personalized interventions, as well as more precisely identifying college students who exhibit excessive reactions or are filled with fear and negative expectations towards the future due to negative information [6, 42]. Thus, targeted and constructive measures can be implemented to curb these behaviors. For example, different intervention plans are provided for different degrees of doomscrolling, including psychological counseling and cognitive-behavioral therapy [43]. Addressing insomnia and depression arising from negative information through timely intervention can further prevent more serious psychological problems among college students.

Finally, we investigated the mediating role of doomscrolling between insomnia and depression. The results

indicated that doomscrolling mediated the bidirectional relationship between insomnia and depression, with approximately half of the effect being mediated by doomscrolling. This further supports insomnia as one of the factors leading to depression, and the behavior of doomscrolling during insomnia may further exacerbate and perpetuate depressive symptoms [44]. Similarly, engaging in doomscrolling may also increase insomnia among individuals with depression [45]. These findings suggest that when university students experience insomnia, they should avoid doomscrolling, particularly at night.

To complement the lack of effective measurement tools for doomscrolling behavior in the Chinese scale, our revised Chinese version of the 15-item Doomscrolling Scale and the 4-item short version have good reliability and validity and can be used as measurement tools in studies of Chinese college students. In addition, the short version of Doomscrolling Scale is easy to use in conjunction with other addiction scales and mental disorder scales, and is also suitable for the time-series assessment of individual behaviors. The revision of this scale can promote the development of relevant research in China. On one hand, with the reports of doomscrolling behavior, Chinese college students gradually increase their awareness of doomscrolling, and may be wary of news media and social media full of negative content, thus reducing their unreasonable behavior of doomscrolling; On the other hand, the reports of relevant studies may attract the attention of university management and urge the implementation of effective management measures. Finally, we also call on relevant news or social media companies to block or reduce relevant negative information push. For example, the "personalized recommendation" function in the mobile app can be turned off to reduce browsing opportunities. In addition, the government should enact corresponding policies to supervise and restrict the information push mechanism of media companies.

### Limitations
First, this study has certain limitations in terms of sample representativeness, mainly due to the uneven distribution of participant grades, small sample size, and the use of convenience sampling, which may result in a homogeneous sample and affect the reliability and generalizability of the results. Given that the participants in this study were primarily freshmen, the findings may not be representative of the overall university student population, especially considering that there may be differences across grades in dimensions such as depression, insomnia disorders, and mobile phone usage time. Similar influences may also arise from the age of the participants. Previous research has indicated that freshmen typically sleep less due to social media usage [46], and that the prevalence of depression is higher among seniors compared to

freshmen [47, 48]. These differences may affect university students' doomscrolling behavior. Therefore, caution should be exercised when generalizing the findings of this study. Future studies should consider increasing the sample size and balancing the number of participants across different grades to enhance the representativeness and generalizability of the results.

Second, although we adopted an anonymous approach during the survey and used standardized scales, emphasizing that there were no right or wrong answers, the self-report method may still present response biases. For example, when answering the depression scale, individuals might respond in a socially desirable manner [49], often reporting fewer psychological issues. To address social desirability bias, future research could consider using diverse data collection methods for cross-validation or incorporating a social desirability scale to identify potentially biased responses [50]. Furthermore, some scales require participants to report their performance over a past period, which may be influenced by recall bias [51]. For instance, feelings of sadness experienced in the past two weeks might be forgotten at the time of response. Additionally, the Likert scale scoring method may lead to extreme response tendencies and fail to capture subtle changes. Future research could consider using scoring methods that can capture fine changes, such as the Visual Analog Scale [52].

Third, the use of a cross-sectional design in this study cannot capture the long-term effects of doomscrolling on mental health. This is particularly relevant as depressive symptoms and doomscrolling behavior are significantly influenced by time. Future research should consider adopting a longitudinal design to track individuals' doomscrolling behavior and mental health over a period of time. This would help reveal the causal relationship between doomscrolling and mental health issues such as insomnia or depression, and provide valuable insights into the dynamic changes of related variables over time. Furthermore, a longitudinal design could serve as a basis for developing preventive interventions, especially in mitigating the negative impact of doomscrolling on mental health at an early stage.

Finally, in this study, we did not control confounding variables, which might affect the true relationship between the independent and dependent variables [53]. One potential confounding factor is the frequency of social media use. Studies have shown that excessive use of social media can lead to addiction [54], which is associated with severe depressive symptoms [55]. Similarly, prolonged social media use can delay sleep time, leading to insomnia [56]. Therefore, future research could consider how the social media use frequency or social media addiction influence the effects of doomscrolling on depression and insomnia. Another potential

confounding factor is the type of negative news, which may include public health crises such as the COVID-19 pandemic in 2020 [57]; natural disasters such as the destruction caused by major earthquakes [58]; and crime and violence events. Exploring the role of news types in doomscrolling behavior will enhance our understanding of doomscrolling. In conclusion, controlling potential confounding variables is crucial for improving the internal validity of research when exploring the relationship between depression and insomnia disorders.

## Conclusions

This study aimed to validate the Chinese version of Doomscrolling Scale among Chinese university students. The Chinese version demonstrated high reliability and validity, showing significant associations with depression, anxiety, and smartphone addiction. Additionally, it revealed that doomscrolling may mediate the relationship between insomnia disorder and depression. This validated measurement tool provides a foundation for further research on the mechanisms and impacts of doomscrolling on mental health.

### Abbreviations

| | |
|---|---|
| QR | Quick response |
| M | Mean |
| SD | Standard deviation |
| PHQ-9 | Patient health questionnaire |
| DSM-IV | Diagnostic and statistical manual of mental disorders |
| GAD-7 | Generalized anxiety disorder |
| SAS-SV | Smartphone addiction scale short version |
| EFA | Exploratory factor analyses |
| CFA | Confirmatory factor analysis |
| RMSEA | Root mean square error of approximation |
| CFI | Comparative fit index |
| TLI | Tucker–Lewis index |
| IFI | Incremental fit index |
| SRMR | Standardized root mean square residual |
| KMO | Kaiser–Meyer–Olkin |
| CVI | Content validity index |
| CR | Critical ratio |

## Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12888-024-06006-5.

> Supplementary Material 1

### Author contributions

T.W. and K.L. contributed to the conception and design of the study. L.Y., K.L., and X.T. wrote the main manuscript text, R.L. collected data and L.Y. prepared figures and tables. All authors reviewed the manuscript.

### Data availability

Data is provided upon request to the corresponding author.

## Declarations

### Ethics approval and consent to participate

All procedures were conducted in accordance with the ethical standards of the responsible committee on human experimentation (Chongqing Normal University, China) and with the Helsinki Declaration of 1975, as revised in 2000 (5). Informed consent was obtained from all participants included in the study. This research received ethical approval from the Chongqing Key Laboratory of Psychological Diagnosis and Educational Technology for Children with Special Needs (Ethics Number: CSTJ-RE-20230620004).

### Consent for publication

Not applicable.

### Competing interests

The authors declare no competing interests.

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## Publisher's Note