ORIGINAL ARTICLE

Understanding Emptiness in a Chinese Sample: Cross-cultural Validation, Latent Profile Analysis, and Association with Short-Form Video Addiction

Wenlong Mu[1] · Lingwen Kong[1] · Along He[2]

Abstract

This study aimed to test the psychometric properties of the Chinese version of the Multidimensional Sense of Emptiness Scale (MSES-C) and further examine the association between emptiness and short-form video addiction (SFVA). In study 1, our findings indicated that the bifactor-CFA model represented the optimal solution for representing the factor structure of the MSES-C, and the bifactor-CFA model showed measurement invariance across gender groups. Additional analyses supported the reliability and convergent validity of the MSES-C. In study 2, the results of the Latent Profile Analysis revealed the existence of three profiles: "Low emptiness" (44.4%), "Moderate emptiness" (32.3%), and "Severe emptiness" (23.3%). Additionally, more intense experiences of emptiness were associated with more severe SFVA. Overall, the MSES-C is a reliable tool for future studies investigating emptiness in Chinese populations. In addition, when relevant departments deal with the emerging social phenomenon of SFVA, mental health issues such as emptiness should not be ignored.

Emptiness is defined as "a sense of detachment from the lived experience" (Ermis-Demirtas et al., 2022, p. 922). In the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V), emptiness is considered a distinctive diagnostic marker for borderline personality disorder (BPD), allowing for a quick and accurate differentiation

✉ Along He
along_he@smail.nju.edu.cn

Wenlong Mu
mu.w@whu.edu.cn

Lingwen Kong
KLW13657191613@outlook.com

1 School of Journalism and Communication, Wuhan University, Bayi Road, Wuchang District, Wuhan, Hubei, People's Republic of China

2 School of Journalism & Communication, Nanjing University, Xianlin Avenue, Qixia District, Nanjing, Jiangsu, People's Republic of China

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from other potentially confusing mental disorders (APA, 2013). Furthermore, the eleventh edition of the International Statistical Classification of Diseases and Related Health Problems (ICD-11) also recognizes emptiness as a hallmark characteristic of BPD, and emptiness is recognized as a typical depressive mood, which is correlated with the social or cultural environment (WHO, 2022).

Research efforts in emptiness have grown rapidly in recent years. Emptiness has been found to be inextricably linked not only to BPD, but also to several other mental disorders (He et al., 2023), such as narcissistic personality disorders (Kernberg, 1992) and schizophrenia spectrum disorders (Zandersen & Parnas, 2019). A study conducted by Klonsky (2008) indicated that 26 to 34% of individuals diagnosed with mental disorders, aside from BPD, reported a chronic feeling of emptiness. Researchers have also revealed the associations between emptiness and negative emotional states, such as depression (D'Agostino et al., 2020), boredom (Van Tilburg & Igou, 2012), and loneliness (Kernberg, 1992). Additionally, emptiness has been identified as a significant contributor to many addictive behaviors. For instance, a survey conducted among 285 online gamers revealed a moderate correlation between emptiness and internet gaming disorder (Casale et al., 2023). Even more important, it has been shown that emptiness can lead to non-suicidal self-injury (Rallis et al., 2012) and suicidal behaviors (Blasco-Fontecilla et al., 2013).

The Development of Emptiness-Related Scales

A reliable and valid measure of emptiness is indispensable for implementing various emptiness-related studies and maximizing utility across various clinical presentations. There are now two approaches to measuring emptiness. Some studies have treated emptiness as a sub-construct below a high-order construct, and therefore, the emptiness scale is usually embedded in a scale of a high-order construct, such as the emptiness subscale in the Borderline Personality Questionnaire (BPQ, Poreh et al., 2006) and the emptiness subscale in the Mental Pain Questionnaire (MPQ, Orbach et al., 2003). However, these emptiness subscales were criticized for lacking conceptual clarity and overlapping with other concepts. For example, the emptiness subscale in BPQ included items related to loneliness (e.g., "*I rarely feel lonely*") and boredom (e.g., "*In general, my life is pretty boring*"). The emptiness subscale in MPQ included items related to desires (e.g., "*I have no desires*") and goals (e.g., "*I have no future goals*").

As emptiness is seen as a transdiagnostic construct, additional studies operationalized emptiness independently rather than treating it as a subdimension of other constructs (Price et al., 2022). To the best of our knowledge, four scales have been developed to measure emptiness. The first author to operationalize emptiness and develop a measurement tool was Hazell (1984), who designed and validated the Experienced Level of Emptiness Scale (ELES). Using Principal Component Analysis (PCA), Hazell (1984) obtained a two-factor structure of ELES containing Experienced Level of Emptiness and Experienced Level of Concern. The ELES was criticized for lacking a clear distinction from associated constructs (e.g., alexithymia and depersonalization) and not containing other possible components (e.g., absence of relatedness to others and lack of meaning and purpose, Ermis-Demirtas et al., 2022; Price et al., 2022). Buggs (1996) also attempted to develop a two-factor structure of the Emptiness Scale (i.e., Inner Sense of Hunger and Yearning and Generalized Sense of Emotional Numbness). However, the results of PCA only supported a one-factor structure rather than a

two-factor structure. Similar to the ELES, the Emptiness Scale was criticized for overlapping with associated constructs (e.g., boredom and loneliness). Because both ELES and Emptiness Scale suffered from overlapping with closely related yet conceptually distinct constructs, Price et al. (2022) developed a 5-item Subjective Emptiness Scale (SES) based on the core features of emptiness. Although the SES showed good psychometric properties in general and clinical samples, it did not reflect the multidimensionality of emptiness. To capture the multidimensionality of the emptiness, Ermis-Demirtas et al. (2022) developed the Multidimensional Sense of Emptiness Scale (MSES). The MSES was designed to measure four aspects of emptiness: sense of inner emptiness (SIE), sense of absence of relatedness (SAR), sense of meaninglessness (SM), and sense of spiritual emptiness (SPE). The results indicated that the MSES was best characterized by a second-order structure with SIE, SAR, and SM as the first-order factors. The internal consistency of the subscales and total scale of MSES was found to be commendable across all samples. Additionally, by examining the relationships between MSES and several theoretically relevant constructs, they provided evidence of convergent validity. In conclusion, the MSES that captures the core features of emptiness while also reflecting the multidimensionality of emptiness demonstrated favorable psychometric properties (Ermis-Demirtas et al., 2022).

Emptiness in the Context of Chinese Culture

The utilization of the MSES has been limited to the USA so far, and there is currently no research on its measurement properties within the Chinese population. There are several reasons for the validation of the Chinese version of MSES (MSES-C). First, cultural differences may influence the way individuals understand emptiness. Compared to the individualistic culture prevalent in the West, China is significantly more influenced by a collectivistic culture (Triandis, 1989). Individuals in collectivist cultures have distinct perspectives on the two fundamental aspects of emptiness, namely SAR and SM, as compared to individuals in individualistic cultures (Triandis et al., 1988). Second, China's modernization is characterized by both the external manifestation of social transformation and the internal emptiness experienced by its people (Sun, 2019). This can be attributed to the rapid development of China's economy since the reform and opening up, which has significantly improved the material standard of living for its people. However, their spiritual needs have not been fully met, resulting in a sense of emptiness. Moreover, China's emphasis on atheism has led to a general lack of religious beliefs (Tang, 2014), making it difficult for individuals to fill this void with religious practices. In a study conducted by Cui and Chen (2023) on the psychological well-being of elderly women aged over 74 in Tangshan, China, it was found that 27.5% of participants reported experiencing feelings of emptiness, which indicated the tangible presence of emptiness within the Chinese. Therefore, the validation of the MSES-C is necessary for further research on Chinese emptiness. Additionally, cross-linguistic validation of the scale is important for international comparative studies on emptiness, as it ensures a consistent understanding of emptiness across different cultural and linguistic groups. Therefore, a validity and reliability assessment of the MSES-C was advocated in the present study to identify its suitability in assessing Chinese emptiness.

Emptiness Profiles and Short-Form Video Addiction

In general, previous research on emptiness has tended to focus on the whole level of emptiness and its associations with outcome variables utilizing a variable-centered approach. However, this approach is based on the assumption that all individuals belong to a homogeneous group (Meyer & Morin, 2016). In contrast, Latent Profile Analysis (LPA) is an alternative person-centered approach that assumes heterogeneity among individuals, which can identify heterogeneous subgroups that show the same pattern within a population based on a set of continuous variables (Meyer & Morin, 2016). As far as we know, only one study has explored the vulnerability profiles of subjective emptiness among sexual minorities using LPA. Specifically, He et al. (2023) used LPA to explore vulnerability profiles of subjective emptiness and self-criticism in a sample of gay and bisexual men and identified four possible profiles based on the co-occurrence of these two variables: low-, mild-, moderate-, and high-level risk profiles. Although previous variable-centered research suggested that emptiness might be a common negative emotional experience among individuals (Martin & Levy, 2022), limited person-centered research suggests that emptiness is likely to be heterogeneous across individuals in the broader population. Thus, this study aimed to uncover different patterns of emptiness among Chinese populations by using LPA.

Furthermore, the 52nd China statistical report on Internet development showed that as of June 2023, the number of Internet users in China has reached 1.079 billion. Among them, the number of short-form video users reached 1.026 billion, with a user utilization rate of 95.2% (China Internet Network Information Center, 2023). Short-form videos use algorithms and big data to analyze users' viewing habits and preferences, and accurately and continuously push massive content that matches users to them (Nguyen & Veer, 2024). The rapid development of short-form video is a double-edged sword. While rich and diverse content meets the various intellectual and emotional needs of individuals, short-form videos with strong entertainment qualities are more likely to make them addicted, increasing the risk of short-form video addiction (SFVA, X. Zhang et al., 2019). Similar to the definition of Internet addiction (Burnay et al., 2015), SFVA can be defined as a disorder in which a person is unable to control his or her use of short-form video, resulting in significant distress and/or dysfunction and further psychological, social, school, and/or work difficulties.

A systematic review of emptiness pointed to a growing body of research demonstrating a strong positive association between emptiness and depression (Miller et al., 2020). However, there is limited research exploring the association between emptiness and behavioral addictions, particularly Internet-specific addictions. Specifically, based on a sample of 278 young Israeli adults, Zerach (2021) found a significant positive correlation between emptiness and problematic mobile phone use. Similarly, a survey of 285 online gamers showed that emptiness was positively associated with Internet gaming disorder (Casale et al., 2023). These limited studies enlighten us that emptiness is likely to be positively related to SFVA. In addition, the interaction of person-affect-cognition-execution (I-PACE) model developed by Brand et al. (2016) helps to explain how emptiness affects SFVA. In this model, the "Person" and "Affect" components refer to the individual's characteristics (e.g., psychopathological features) and affective states (e.g., emotion regulation), which are risk factors for specific Internet addiction. Based on the above literature and model, we speculate that emptiness is likely to be related to SFVA. In the current study, the MSES-C was expected to be useful in screening individuals

with different levels of emptiness related to SFVA. In summary, this study will also focus on a new behavioral addiction phenomenon (i.e., SFVA) that may be particularly relevant to emptiness. On this basis, we further examined the association between emptiness profiles and SFVA.

The Current Study

The objectives of the current study were threefold. Accordingly, three main research questions are addressed:

a) Does the MSES-C present satisfactory psychometric properties among Chinese populations?
b) What are the underlying emptiness profiles that can be identified among Chinese populations?
c) How is membership in the identified emptiness profile associated with SFVA?

Study 1: The Cross-Cultural Validation of the MSES-C

The first study examined the psychometric properties of the MSES in the Chinese cultural context. Data were collected through self-reported measures.

Method

Participants

The initial cohort of participants in this study comprised 539 individuals. Among the participants, 39 participants were excluded due to attention check failures or unqualified response times. The final dataset consisted of 500 participants (312 women, 62.4%; 188 men, 37.6%). The age range of the participants spanned from 18 to 66 years, with a mean age of 31.09 years ($SD = 7.85$). Table 1 provides an overview of the demographic information of the valid sample. The participants completed a questionnaire package, encompassing MSES-C and its associated constructs (loneliness, depression, and meaning in life). All participants identified themselves as Chinese.

Measures

Emptiness

Emptiness was measured by the 13-item MSES developed by Ermis-Demirtas et al. (2022). The MSES consisted of SIE, SAR, and SM subscales. Individuals were asked to rate the frequency of their subjective experience using a 5-point scale ranging from 1 (*none or little of the time true of me*) to 5 (*most or all of the time true of me*). The translation process of the scale is presented in the following Procedure section. The MSES-C is presented in the Appendix.

Table 1 Demographic information description of the valid samples

Variable	Study 1 (N = 500)		Study 2 (N = 486)	
	N/M ± SD	%/range	N/M ± SD	%/range
Gender				
Female	312	62.40	318	65.43
Male	188	37.60	168	34.57
Age	31.06 ± 7.86	18–66	29.03 ± 7.57	17–58
Self-assessment of social status	5.77 ± 1.54	1–10	/	/
Monthly salary				
≤ 2000	/	/	78	16.05
2001–5000	/	/	102	20.99
5001–10,000	/	/	167	34.36
10,001–20,000	/	/	101	20.78
≥ 20,001	/	/	38	7.82
Education				
Senior high school and below	19	3.80	22	4.53
Polytechnic/undergraduate education	424	84.80	370	76.13
Postgraduate education and above	57	11.40	94	19.34
Marital status				
Single	138	27.60	216	44.44
Married	362	72.40	270	55.56

M, mean; *SD*, standard deviation

Depression

We applied the Patient Health Questionnaire-9 (PHQ-9) to assess depression (Kroenke et al., 2001). The PHQ-9 required participants to report the frequency of depressive symptoms experienced over the past two weeks. The PHQ-9 comprised nine items, with response options ranging from 1 (*not at all*) to 4 (*nearly every day*). Previous research showed good psychometric properties of the PHQ-9 in Chinese (Wang et al., 2014). In this study, the PHQ-9 exhibited good internal consistency reliability (α = .87, ω = .87).

Loneliness

The 8-item UCLA Loneliness Scale (ULS-8) was used to assess individuals' subjective experiences of loneliness (Hays & DiMatteo, 1987). The ULS-8 assessed participants' loneliness symptoms by inquiring about the frequency of corresponding symptoms experienced. Response options ranged from 1 *(never)* to 4 *(always)*. After reverse coding the two negatively worded items, a higher mean score indicated a greater sense of loneliness. Previous research showed that the ULS-8 possessed decent psychometric features in Chinese (Chen et al., 2021). The ULS-8 exhibited excellent internal consistency reliability in this study (α = .88, ω = .88).

Meaning in Life

We applied the 5-item Meaning in Life Questionnaire-Presence Subscale (MLQ-PS) to evaluate the subjective sense that one's life is meaningful (Steger et al., 2006). Respondents should rate on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). A higher mean score indicated a higher degree of meaning in life. The MLQ-PS had good psychometric properties in Chinese (Liu & Gan, 2010). In this study, the MLQ-PS had good internal consistency reliability ($\alpha = .89$, $\omega = .90$).

Procedure

We administered the questionnaire through the Credamo platform, which is an online integrated data platform for research and modeling widely utilized in China (https://www.credamo.com). Data was collected in August 2023. At the beginning of the questionnaire, participants were presented with an informed consent form. Continued participation signified their consent to the terms outlined in the form. Each participant received a compensation of 2 RMB (approximately $0.28) upon completion. Within the questionnaire, an attention check item was introduced to screen for careless responses. According to the questionnaire item count and normal response duration, participants with response times below 120 s were deemed invalid data. Ultimately, 39 participants were excluded due to either failing the attention check or providing responses with inadequate completion times. The online survey required participants to complete each question before submission, thus ensuring the absence of missing values.

We employed the forward-backward procedure suggested by Beaton et al. (2000) to translate the MSES into Chinese. Specifically, we created a tripartite translation team that included five bilingual fluent members (Chinese and English). First, two members independently translated MSES from English to Chinese. After discussion, they resolved differences in wording to obtain a consistent Chinese version. Second, the MSES-C was independently translated back into English by two other members who were not aware of the first translation task. Subsequently, they reached a consensus on the wording of the English version of MSES. An expert with extensive experience in scale development and assessment compared the back-translated version with the original version of the MSES and found that there were no significant differences between the two in terms of content and concepts. Finally, we recruited 12 volunteers to pretest the MSES-C. They were required to complete the scale, after which we inquired whether they encountered sentences that were unclear, difficult to understand, or contained specialized terminology during the process. Additionally, participants were asked for any suggestions regarding potential revisions. Finally, we adjusted some wording of the items and entered into the data collection phase. The procedures of the present study were approved by the Ethics Committee of Wuhan University.

Data Analysis

Since the MSES-C is a theory-based model, it is inappropriate to explore its factor structure through Exploratory Factor Analysis (Huang et al., 2022). Therefore, we conducted confirmatory factor analysis (CFA) and compared three alternative models. For the single-factor model, the 13 items were loaded onto a single latent factor. For the first-order three-factor model, all

13 items were loaded onto the specific factors (S-factors) they were designed to measure, with these factors allowed to correlate with each other. According to the identification rules of CFA, if a scale comprises three first-order factors, the first-order and second-order models are equivalent, yielding the same fit indices. Therefore, this study did not conduct a separate analysis for the second-order model. Instead, the bifactor model was constructed. The bifactor model can address the hierarchical nature of emptiness. For the bifactor model, each item was simultaneously loaded on a general MSES factor (G-factor) and S-factors. Based on prior studies employing the bifactor model, we set all factors to undergo orthogonal rotation (Morin et al., 2016; Wang et al., 2020; Xie et al., 2022). The orthogonal rotation facilitates a clearer interpretation of the relationship between the S-factors and observed items both above and beyond the G-factor (Reise, 2012). The graphical representations of the three models are presented in the Appendix. After determining the best-fit factor model for the MSES-C by comparatively evaluating the three alternative models, we then assessed the measurement invariance (MI) of the MSES-C across genders. First, a test of configural invariance was conducted to verify if the factor structure between the male and female groups was equivalent, without imposing any constraints on any parameters. This served as the foundation for subsequent MI analyses. Second, metric invariance was examined, wherein factor loadings across different groups were constrained to be equal. Finally, scalar invariance was tested by further constraining intercepts between groups on the basis of the metric model. All models were estimated using the robust maximum likelihood (MLR) estimator in Mplus 8.0 (Muthén & Muthén, 2017).

To assess the goodness-of-fit for the three alternative models, we used several indices. First, the comparative fit index (CFI) was adopted, with values equal to or greater than .90 indicating acceptable fit, and those equal to or greater than .95 indicating good fit. Additionally, we considered the Tucker-Lewis index (TLI), where values of .90 or higher denoted acceptable fit, and .95 or higher denoted good fit. The root mean square error of approximation (RMSEA) was also examined, with values equal to or less than .06 signifying good fit. To facilitate model comparison, we analyzed the changes in these fit indices. An increase in RMSEA $\leq$ .015 and a decrease in CFI $\leq$ .010 showed the establishment of more restrictive levels of invariance. Additionally, we employed the change in sample size adjusted Bayesian Information Criteria (ΔABIC) as a further criterion for model comparison. A ΔABIC value exceeding 10 suggested that the model with the lower ABIC provided a superior fit to the data (Kuha, 2004). For completeness of reporting, the chi-square test of model fit was included. However, it is important to note that we did not solely rely on the chi-square test, recognizing its sensitivity to sample size (Cheung & Rensvold, 2002).

To examine the internal consistency of both the total MSES-C scale and its subscales, we computed Cronbach's alpha (α) and McDonald's omega (ω). Finally, to assess the convergent validity of MSES-C, we computed Pearson correlations of MSES-C with the PHQ-9, ULS-8, and MLQ-PS. Both α and Pearson correlations were calculated using SPSS 26.0 (George & Mallery, 2019). The value of ω was calculated using the formulas in the Excel spreadsheet by Dueber (2017).

Results

Structural Validity

We conducted CFA to examine the three alternative models. Table 2 provides the goodness-of-fit indices for these models.

Single-Factor Model

The single-factor model allocated all observed items to one latent factor. According to the provided reference standards, the CFI (.944) and TLI (.933) of the single-factor model reached an acceptable level, while the RMSEA (.084) did not meet the desired threshold. These indicators reflected a relatively poor fit.

First-Order Three-Factor Model

The first-order three-factor model demonstrated acceptable model fit (see Table 2). In comparison to the single-factor model, the first-order three-factor model exhibited a marked improvement in fit indices (ΔCFI = .014, ΔTLI = .014, ΔRMSEA = − .009). The fit indices for the second-order model were equivalent to those of the first-order three-factor model.

Bifactor-CFA Model

In the bifactor-CFA model, the thirteen items in the MSES-C were respectively loaded onto three S-factors (i.e., SIE, SAR, and SM), while simultaneously allowing all items to load onto a G-factor. For the fitting indices of the bifactor-CFA model, both the CFI (.975) and TLI (.962) exceeded the threshold for a good fit. The RMSEA (.063) also approximated a good level. Regardless of whether based on the single-factor or first-order three-factor model, the fitting indices of the bifactor-CFA model showed substantial improvement (ΔCFI = .017, ΔTLI = .015, ΔRMSEA = − .012, all significantly surpassing the threshold levels).

In summary, among the three models we tested, the single-factor model yielded a poor fit, the first-order three-factor model demonstrated an acceptable fit, and the bifactor-CFA model exhibited a strong model fit. We compared the first-order three-factor model with the bifactor-CFA model, and the results indicated that the value of ΔABIC was 72.662 (> 10), suggesting that the bifactor-CFA model, with its lower ABIC value, provided a better fit to the data. These findings suggested that the bifactor-CFA model represented the optimal solution for representing the factor structure of MSES-C.

Measurement Invariance

We first estimated the fit metrics of the bifactor-CFA model in the male and female populations separately. The results indicated good fit metrics (see Table 2). Subsequently, multi-group CFA was performed to test the MI of the bifactor-CFA model across gender groups. Three levels of MI from least restrictive (configural invariance) to more restrictive (metric and scalar invariance) were tested. There were no significant changes in CFI ($|\Delta$CFI$| \leq .003$), TLI ($|\Delta$TLI$| \leq .001$), or RMSEA ($|\Delta$RMSEA$| \leq .001$) between the three models. Therefore, MI was supported under the bifactor-CFA model.

Table 2 Goodness-of-fit statistics of the estimated models on the Chinese version of the Multidimensional Sense of Emptiness Scale

Models	χ^2 (df)	CFI	TLI	RMSEA	90%CI	AIC	ABIC	ΔCFI	ΔTLI	ΔRMSEA
Single-factor CFA	293.530 (65)***	.944	.933	.084	.074–.094	14,169.77	14,210.36	/	/	/
First-order Three-factor CFA	235.376 (62)***	.958	.947	.075	.065–.085	14,094.78	14,138.49	.014	.014	–.009
Bifactor CFA	156.075 (52)***	.975	.962	.063	.052–.075	14,011.72	14,065.82	.017	.015	–.012
Bifactor CFA (man)	73.181 (52)***	.986	.979	.047	.016–.070	5271.97	5275.56	/	/	/
Bifactor CFA (woman)	104.005 (52)***	.980	.971	.057	.041–.072	8759.27	8788.98	/	/	/
Configural invariance	182.793 (104)***	.981	.972	.055	.042–.068	14,034.12	14,142.34	/	/	/
Weak invariance	218.816 (126)***	.978	.973	.054	.042–.066	14,032.57	14,117.90	–.003	.001	–.001
Strong invariance	231.712 (135)***	.977	.973	.054	.042–.065	14,021.35	14,097.31	–.001	0	0

CFA, confirmatory factor analysis; *CFI*, comparative fit index; *TLI*, Tucker-Lewis index; *RMSEA*, root mean square error of approximation; *90% CI*, 90% confidence interval of the RMSEA;. AIC, Akaike information criteria; *ABIC*, Adjusted Bayesian Information Criteria, ΔCFI = change in CFI value, ΔTLI = change in TLI value, ΔRMSEA = change in RMSEA value. *** $p < .001$

Reliability Indices

We computed the internal consistency reliability coefficients for both the G-factor and S-factors of the MSES-C (see Table 3). The G-factor and S-factors had excellent values of α ($α$ = .87 to .95). Given the criticisms surrounding the reliability of $α$, there is a need to utilize model-based ω coefficients in assessing reliability. The ω values for the G-factor, SIE, SM, and SAR were .96, .89, .91, and .90, respectively. The results indicated that the G-factor and S-factors had good internal consistency reliability.

To reflect the proportion of systematic variance in total score that can be explained by the individual differences on the G-factor, ω hierarchical ($ω_H$) was computed. Simultaneously, ω hierarchical for every S-factor ($ω_{HS}$) was calculated to indicate the percentage of systematic variance in a subscale score attributable to an S-factor after eliminating the variance associated with the G-factor.

The $ω_H$ value (= .933) was high, indicating that 93.3% of the variability in total scores was explained by the G-factor. In addition, the high value of ECV_{GF} (= .872) indicated that 87.2% of the common variance in the items was attributed to the G-factor. Both the values of $ω_H$ and ECV_{GF} exceeded the recommended thresholds ($ω_H$ > .80, ECV_{GF} > .70, Reise et al., 2013; Rodriguez et al., 2016), indicating that the MSES-C was essentially unidimensional.

Convergent Validity

We assessed the associations between the MSES-C factors and three theoretically related constructs (i.e., depression, loneliness, and meaning in life) to examine convergent validity (see Table 3). The results demonstrated significant positive correlations between the MSES-C and its subscales with depression and loneliness in the bivariate correlation analyses. This aligned with our anticipated direction and provided initial evidence for convergent validity. Furthermore, the MSES-C and its subscales exhibited significant negative correlations with the meaning in life.

Study 2: Further Exploration of Emptiness Profiles

The second study conducted LPA to identify the potential emptiness profiles and used the Bolck, Croon, and Hagenaars (BCH) approach to examine the association between profile membership and SFVA. Data were collected through self-reported measures.

Method

Data Collection and Participants

Study 2 utilized the same data collection procedure as study 1, and the data were gathered in October 2023. In a literature review of LPA, Spurk et al. (2020) pointed out that the median sample size in previous studies was 494 (ranging from 131 to 16,280), suggesting that a sample size of around 500 seems reasonable.

Therefore, we collected 510 participants. However, 24 participants were excluded due to attention check failures or unqualified response times. The final dataset consisted of

Table 3 Descriptive statistics and bivariate correlations of the study variables

Study 1	1. MSES	2. SIE	3. SAR	4. SM	5. Depression	6. Loneliness	7. MLQ-PS	Study 2	1. MSES	2. SFVA
1	-	.94***	.95***	.92***	.79***	.87***	−.81***	1	-	.66***
2			.82***	.80***	.73***	.80***	−.71***	2		
3				.84***	.77***	.85***	−.66***			
4					.74***	.80***	−.81***			
5						.80***	−.67***			
6.							−.74***			
Mean	2.01	2.16	1.92	1.90	1.58	1.68	5.69	Mean	2.63	4.14
SD	0.81	0.88	0.82	0.90	0.49	0.59	1.14	SD	.93	1.47
α	.95	.88	.90	.87	.87	.88	.89	α	.94	.90
ω	.96	.89	.91	.90	.87	.88	.90	ω	.94	.90

MSES, Multidimensional Sense of Emptiness Scale; *SIE*, Sense of Inner Emptiness; *SAR*, Sense of Absence of Relatedness; *SM*, Sense of Meaninglessness; *MLQ-PS*, Meaning in Life Questionnaire-Presence Subscale; *SFVA*, short-form video addiction; *SD*, standard deviation; *α*, Cronbach's alpha; *ω*, McDonald's omega. ****p* < .001

486 participants (318 women, 65.4%; 168 men, 34.6%). The age range of the participants spanned from 17 to 58 years, with a mean age of 29.03 years ($SD = 7.57$). All participants identified themselves as Chinese. Table 1 provides demographic information of the sample.

Measures

In study 2, we used the same measurement tools for emptiness as in Study 1.

Short-form Video Addiction

SFVA was assessed by six items adapted from the Social Network Service Addiction Scale (Choi & Lim, 2016). The scale evaluated how much excessive viewing of short videos hurt personal life, work, and mood. It has been adapted to measure SFVA among Chinese adolescents and has shown good psychometric properties (Wang et al., 2023). A sample item was "I have attempted to spend less time on short-form video but have not succeeded." Participants rated each item on a seven-point scale ranging from 1 (strongly disagree) to 7 (strongly agree) with a higher mean score indicating a greater severity of SFVA. The SFVA exhibited excellent internal consistency reliability in this study ($\alpha = .90$, $\omega = .90$).

Data Analysis

Firstly, based on all the items of the MSES-C, LPA was used to distinguish the latent subgroups of our participants who shared similar emptiness profiles. We used the following indices to compare and determine the suitability of the results: the low Akaike information criterion (AIC), the Bayesian information criterion (BIC), ABIC, and high entropy (Lubke & Muthén, 2007). Furthermore, we used the small p-value of the Lo–Mendell–Rubin-adjusted likelihood ratio (LMR) and bootstrap likelihood ratio (BLRT) to further identify the model's goodness-of-fit. These indices show whether an accepted profile model is remarkably better than a model with fewer profiles (Lo et al., 2001).

Then, we used the BCH approach to examine the group differences in SFVA. The BCH approach calculates an ANOVA model using the observed variables, which performs well when the variance of the auxiliary variables significantly differs across profiles in the final stage (Bakk & Vermunt, 2016).

Results

Descriptive Statistics and Correlation

Table 1 exhibited the means, standard deviations, α, ω, and bivariate correlation of the two variables used in study 2. As expected, emptiness was positively related to SFVA ($r = .66$, $p < .001$).

Latent Profile Analysis

Table 4 presents the model fit indices for a two- to five-profile solution based on all items of the MSES-C. Grouping participants into three profiles was the best solution for the current sample. Specifically, the value of entropy of the five-profile solution (entropy =

Table 4 Goodness-of-fit indices for different latent profile analysis models

Model	Log	AIC	BIC	ABIC	Entropy	LMR	BLRT	Class size N (%)				
								C1	C2	C3	C4	C5
2-profile	− 8604.03	17,288.07	17,455.51	17,328.56	.95	< .001	< .001	256 (52.7)	230 (47.3)			
3-profile	**− 8171.39**	**16,450.78**	**16,676.83**	**16,505.44**	**.94**	**< .001**	**.001**	**216 (44.4)**	**157 (32.3)**	**113 (23.3)**		
4-profile	− 8034.57	16,205.14	16,489.80	16,273.97	.94	.127	< .001	212 (43.6)	77 (15.8)	90 (18.5)	107 (22.0)	
5-profile	− 7900.88	13,5965.76	16,309.03	16,048.77	.92	.045	< .001	107 (22.0)	131 (27.0)	87 (17.9)	70 (14.4)	91 (18.7)

Log, log-likelihood; *AIC*, Akaike's information criterion; *BIC*, Bayesian Information Criterion; *ABIC*, sample size adjusted BIC values; *LMR*, Lo-Mendell-Rubin-adjusted likelihood ratio test; *BLRT*, bootstrapped likelihood ratio test. Bold indicates "best" fit for each respective statistic

.923) was the lowest, and the *p*-value of the LRT (*p* = .045) was poorer than the two- and three-profile solutions. Thus, the five-profile solution was first excluded. Furthermore, the *p*-value of the LRT (*p* = .127) of the four-profile solution was poorer than the two- and three-profile solutions. Thus, the four-profile solution was also excluded. Then, the three-profile solution showed a lower AIC, BIC, and ABIC than the two-profile solution. Finally, we believed that the three-profile solution was more nuanced in distinguishing the heterogeneity of participants than the two-profile solution.

Comprised of individuals with the lowest level of emptiness, the first profile was named "Low emptiness" (*n* = 216, 44.4%). Most of the individuals in this profile scored lower on all items than those in the remaining groups (Emptiness: *M* = 1.77, *SE* = 0.331).

The second profile was labeled "Moderate emptiness" (*n* = 157, 32.3%), which was representative of individuals with moderate levels of emptiness. Most of the individuals in this profile reported slightly low-average levels of emptiness, and the mean score of each item was higher than profile 1 (Emptiness: *M* = 2.90, *SE* = 0.560).

The third profile was labeled "Severe emptiness" (*n* = 113, 23.3%), and this profile included individuals with the highest level of emptiness. Compared to the other profiles, individuals in this profile scored highest for all items (Emptiness: *M* = 3.93, *SE* = 0.215). Table 5 and Fig. 1 show the mean levels of all items of emptiness in each profile.

Association Between Profile Membership and SFVA

Individuals in profile 3 had the highest score of SFVA (*M* = 5.366, *SE* = 0.079), followed by profile 2 (*M* = 4.611, *SE* = 0.092), then profile 1 (*M* = 3.168, *SE* = 0.094). Multiple group analyses revealed statistically significant differences in SFVA among the

Table 5 Descriptive statistics per latent profile

	Profile 1 (*n* = 216)	Profile 2 (*n* = 157)	Profile 3 (*n* = 113)
	M (SE)	*M (SE)*	*M (SE)*
Emptiness 1	1.80 (.060)	3.51 (.095)	3.96 (.070)
Emptiness 2	2.78 (.097)	4.11 (.062)	4.45 (.061)
Emptiness 3	1.86 (.074)	3.31 (.090)	3.85 (.098)
Emptiness 4	1.61 (.049)	3.22 (.108)	3.93 (.098)
Emptiness 5	1.77 (.048)	3.24 (.117)	3.95 (.101)
Emptiness 6	1.53 (.040)	2.22 (.085)	3.65 (.113)
Emptiness 7	1.71 (.048)	2.63 (.109)	4.08 (.064)
Emptiness 8	1.60 (.052)	2.48 (.095)	3.87 (.094)
Emptiness 9	1.72 (.051)	2.48 (.098)	3.91 (.073)
Emptiness 10	1.60 (.047)	2.48 (.098)	3.95 (.077)
Emptiness 11	1.41 (.042)	2.21 (.098)	3.53 (.115)
Emptiness 12	1.77 (.061)	2.83 (.107)	4.04 (.102)
Emptiness 13	1.84 (.064)	2.95 (.111)	3.91 (.094)
Emptiness	1.77 (.331)	2.90 (.560)	3.93 (.215)
SFVA	3.17 (.094)	4.61 (.092)	5.37 (.079)

Profile 1 = low emptiness, profile 2 = moderate emptiness, profile 3 = severe emptiness; *M*, mean; *SE*, standard error; *SFVA*, short-form video addiction
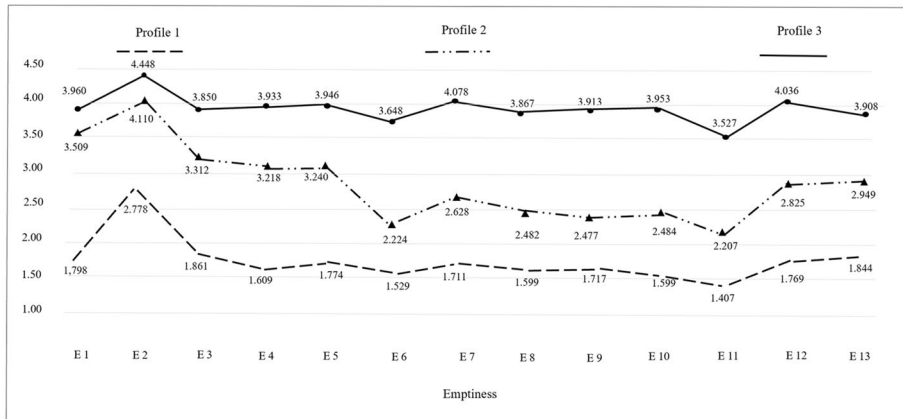
Fig. 1 Mean scores of each item of emptiness on the three profiles. *Notes.* E1–E13 = items 1–13 of the Multidimensional Sense of Emptiness Scale

emptiness profiles ($\chi^2 = 322.782$, $p < .001$). Specifically, differences existed between profiles 1 and 2 ($\chi^2 = 115.627$, $p < .001$), profiles 1 and 3 ($\chi^2 = 321.028$, $p < .001$), and profiles 2 and 3 ($\chi^2 = 37.110$, $p < .001$) (see Table 6). Overall, severe emptiness was associated with a higher level of SFVA.

Discussion

The primary purpose of study 1 was to examine the psychometric properties of the MSES in the Chinese cultural context. Our findings indicated that the MSES-C had satisfactory construct validity, MI, reliability, and convergent validity. Additionally, in study 2, we used LPA to identify distinct patterns of emptiness based on all items of the MSES-C. Three different profiles were identified: the "Low emptiness" profile, "Moderate emptiness" profile, and "Severe emptiness" profile. Then, we examined the differences in SFVA as a new behavioral addiction phenomenon among these profiles using the BCH approach. In sum, more intense experiences of emptiness were associated with more severe SFVA.

Table 6 Multiple group analyses to examine differences in short-form video addiction between the emptiness profiles using the Bolck, Croon, and Hagenaars approach

Heath outcomes	Chi-square tests	χ^2	p
SFVA	**Overall test**	322.78	**< .001**
	Profile 1 vs. 2	115.63	**< .001**
	Profile 1 vs. 3	321.03	**< .001**
	Profile 2 vs. 3	37.11	**< .001**

Profile 1 = low emptiness, Profile 2 = moderate emptiness, Profile 3 = severe emptiness; *SFVA*, short-form video addiction

Validation of the MSES-C

To examine the construct validity of the MSES-C, three alternative models (i.e., single-factor model, first-order three-factor model, and bifactor-CFA model) were compared. In contrast to Ermis-Demirtas et al.'s (2022) study, our findings suggested that the bifactor-CFA model represented the optimal solution for representing the factor structure of the MSES-C. The bifactor-CFA model could model the direct association of the S-factors and G-factor on individual item responses. This approach offered the additional advantage of facilitating the calculation of ω_H values that reflect the proportion of systematic variance in the total score that can be explained by the individual differences in the G-factor. In this study, the values of ω_H and ECV_{GF} demonstrated that the MSES-C should be interpreted unidimensionally with a total score. The values of α and ω indicated the high internal consistency reliability of the total score and subscores. Overall, although the factor structure of the MSES could be best represented by a bifactor-CFA model rather than a second-order model in the Chinese cultural context, its unidimensionality has not changed.

After identifying the best-fitting model of MSES-C, we further examined the MI of MSES-C across gender groups, which was not evaluated in Ermis-Demirtas et al.'s (2022) study. The bifactor-CFA model of MSES-C demonstrated three levels of MI across female and male populations. Our findings indicated that the emptiness construct was assessed similarly by the MSES-C in female and male populations. Hence, any observed disparity in the total scores of MSES-C between female and male populations should be ascribed to genuine variations in emptiness levels rather than measurement errors.

The bivariate correlation analyses provided evidence for the convergent validity of the MSES-C. In Ermis-Demirtas et al.'s (2022) study, they established a negative association between MSES and meaning in life. Consistent with their finding, our study also found that MSES-C was negatively associated with meaning in life. As a transdiagnostic construct, emptiness is considered to be strongly associated with a variety of negative affective experiences (Miller et al., 2020). First, our findings supported the strong relationship between MSES-C and depression. However, due to the limitations of the cross-sectional data, we were unable to determine a causal relationship between emptiness measured by MSES-C and depression. In addition, emptiness and loneliness are considered highly related symptoms of BPD (Miller et al., 2020). Our results further supported the association between emptiness measured by MSES-C and loneliness. However, it should be noted that emptiness and loneliness are two distinct concepts. Emptiness is "a sense of detachment from the lived experience" (Ermis-Demirtas et al., 2022, p. 922) and loneliness is "a sense of disconnection from the world" (Miller et al., 2020, p.39). Although emptiness and loneliness have a similar basis in a sense of detachment or disconnection, they represent dissimilar kinds of disconnect (Miller et al., 2020). Specifically, emptiness involves a sense of detachment from both self (e.g., values, ideas, and goals) and others, whereas loneliness generally refers to a sense of detachment from others (Miller et al., 2021). In addition, Miller et al. (2021) argued that emptiness is an absence of emotion, while loneliness has a visceral feeling.

Overall, our study indicated that the MSES-C displayed good psychometric properties and proved to be a reliable tool for future studies on investigating emptiness in Chinese populations. In fact, after the reform and opening up, China entered the fast lane of rapid economic development. The increasingly fulfilling material life and the

increasingly scarce spiritual life form a sharp contrast and become a contradiction that cannot be alleviated for a while (Zhang & Zhao, 2023). As a result, individuals increasingly feel emptiness, feel that life is meaningless, and have lost their pursuit. Nowadays, China's new generation of people is facing modern problems such as high housing prices, excessive work, and a fast pace of life (Huang et al., 2023). Confusion and meaninglessness have become the norm in life. Although the presence of emptiness is likely to be widespread and clinically significant, research on the identification, causes, and intervention of emptiness in the Chinese context is scarce. Therefore, developing a measurement tool that is suitable for the Chinese cultural context will be a necessary starting point for extensive research in the future.

The Three Emptiness Profiles and Their Associations with SFVA

By using LPA analysis, three profiles representing the level of emptiness of Chinese populations were identified in our study. They were "Low emptiness," "Moderate emptiness," and "Severe emptiness." Nearly a quarter of participants ("Severe emptiness" profile) reported severe levels of emptiness. They scored very high on all items of emptiness. Our study showed that emptiness was likely to be a very common negative affective state in the Chinese cultural context, which was consistent with research in Western cultural contexts. For example, one study conducted among a large sample of American undergraduates found that feeling of emptiness was a fairly common experience, with relatively high rates of endorsement (Martin & Levy, 2022). Additionally, in a study conducted in the UK that initially included 969 participants, only 19 participants reported never feeling empty (Herron et al., 2024). In fact, under the great changes of the times, as the new generation of the Chinese population grows up, the breakdown of family relationships, the advancement of urbanization, and highly developed information technology have all given rise to individuals' strong self-awareness and alienation from others (Li et al., 2020). In other words, relationships between people are becoming increasingly indifferent. Living alone has become a common lifestyle in China, and the number of people living alone continues to grow (Xiao & Liu, 2023). "The sense of absence of relatedness" is becoming a true portrayal of most people's lives. The lack of community, tradition, and sharing of meaning between people ultimately leads to the long-term emotional deprivation and emptiness of the contemporary Chinese population.

SFVA has become an emerging social phenomenon with potentially negative impacts that require urgent attention (Ye et al., 2022). Therefore, exploring the risk factors that induce SFVA has become the focus of researchers. There are limited studies examining the heterogeneity of emptiness in community samples using a person-centered approach. We believe this is a meaningful exploration that will help identify at-risk populations for severe SFVA. We found that individuals classified into the "Moderate emptiness" and "Severe emptiness" profiles were more likely to report higher levels of SFVA. Our findings on the differences in SFVA among the emptiness profiles are consistent with findings from previous variable-centered research that reported strong associations between emptiness and behavioral addictions (Zerach, 2021). Changes in media technology and society have impacted traditional interpersonal relationships. Modern people have lost their fixed position in traditional society and therefore cannot find the meaning of life. The experience of emptiness has therefore become common and direct (D'Agostino et al., 2020). Nowadays, we are surrounded by massive short-form videos, and our daily lives are increasingly affected by short-form videos. Users are immersed in the world of short videos to obtain

"unlimited" entertainment experience, and obtaining short-term spiritual satisfaction may become one of the ways to directly fill or relieve emptiness. The continuous experience of emptiness may eventually lead to individuals browsing short-form videos uncontrollably and developing addiction tendencies.

Limitations

First, the test-retest reliability of the MSES-C was not evaluated. It is recommended that future longitudinal research further validates the MSES-C, including the test-retest reliability and longitudinal measurement invariance of its factor structure. Second, although the sample size of study 2 was close to the median of previous studies using LPA (Spurk et al., 2020), it was not large enough. Future research could use a larger sample size to explore the emptiness profiles of the Chinese further. Third, our studies only evaluated the association of emptiness with depression, loneliness, meaning in life, and SFVA, while the relationships between emptiness and other variables in its nomological network were not evaluated. Future studies could use the MSES-C to explore the associations between emptiness and other variables, especially to explore what factors could relieve emptiness.

Declarations

Ethical Approval This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of Wuhan University. All participants provided digital informed consent.

Conflict of Interest The authors declare no competing interests.

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