RESEARCH

Open Access

Structure, network analysis, psychometric properties and clinical utility of the self-absorption scale in China

Xingwan Huang[1] and Yixing Liu[1*]

Abstract

Background Self-absorption refers an excessive, persistent, and rigid preoccupation with information regarding the self. This study aims to introduce the Self-Absorption Scale (SAS) into China with an assessment of its latent variable structure, network structure, psychometric properties, and clinical utility in a nonclinical Chinese sample.

Methods 209 participants completed the translated SAS as well as the Short General Health Questionnaire (GHQ-12), rumination subscale of the Rumination-Reflection Questionnaire (RRQ), the Mindful Attention Awareness Scale (MAAS), the Private Self-Consciousness Scale (PrSCS), the Obsessive-Compulsive Inventory-Revised (OCI-R) and the Dissociative Experiences Scale (DES-II). In addition, 30 respondents completed the Chinese version of the SAS and retested it 2 weeks later.

Results The Chinese version of the SAS **(**CH-SAS) had a desirable two-correlated-factor structure with the reverse scored item removed, which was invariant across different genders. The core items in the network structure of the CH-SAS were related to excessive self-immersion, uncontrollability and anxiety aspects of self-absorption. The Cronbach's alpha coefficient for the CH-SAS was 0.903 while the McDonald's omega coefficient was 0.916 and the test-retest reliability was 0.908. The CH-SAS and its two subscales had moderate positive correlations with the rumination subscale of the RRQ (ranging from 0.474 to 0.616; $p < .001$) and the GHQ-12 (ranging from 0.479 to 0.538; $p < .001$), and moderate negative correlations with the MAAS (ranging from -0.413 to -0.360; $p < .001$). The PrSCS has almost no correlation with the CH-SAS and PrSAS ($p > .05$), and its correlation with the PubSAS was significant at the 0.05 level, with a remarkably low correlation coefficient ($r = .157$). The hierarchical regression analysis suggested that the CH-SAS can significantly predict the severity of OCD beyond factors such as depression, anxiety, rumination, dissociation, and mindful attention awareness.

Conclusions The CH-SAS demonstrates excellent reliability, including internal consistency and test-retest reliability. Additionally, it exhibits favorable structural validity, as well as strong evidence of convergent and divergent validity. Furthermore, the self-absorption measured using the CH-SAS contributed significantly to the prediction of OCD beyond other relevant psychological factors, suggesting its clinical utility.

*Correspondence:
Yixing Liu
yixingliu1987@gmail.com

Full list of author information is available at the end of the article

Introduction

Self-awareness involves conscious attention, enabling individuals to adjust and pursue goals linked to a sustained cognitive representation of themselves [1]. This ability plays a significant role in positively regulating behavior and emotions [2]. However, there is also a pathological form of self-awareness that can lead to maladaptive patterns of cognitive, emotional, and behavioral discordance, resulting in mental health problems such as depression [3–5], masochism [6], and other emotional disorders [7, 8]. According to Ingram [9], such a pathological form of self-awareness is self-absorption, defined as an excessive, persistent, and rigid preoccupation with information regarding the self, differing in the kind and intensity of adaptive self-awareness.

By utilizing Ingram's [9] notion of self-absorption, McKenzie and Hoyle [10] developed the Self-absorption Scale (SAS) [10], which is a self-report questionnaire having 17 items rated on a 5-point Likert scale. The SAS comprises two subscales: the Private Self-Absorption Subscale (PrSAS), which measures pathological preoccupation with the self, and the Public Self-Absorption Subscale (PubSAS), which assesses pathological preoccupation with how others perceive the self. The PrSAS score can be obtained by adding seven items that are phrased positively and one item that is scored in reverse, while the PubSAS is calculated by summing 9 positively worded items. Higher SAS scores reflect greater levels of pathological self-absorption.

In the process of developing the SAS, the two subscales were found to have favorable internal consistency (α_{PrSAS}=0.81, α_{PubSAS}=0.89) and excellent test-retest reliability (r_{PrSAS} = 0.60, r_{PubSAS} = 0.73) in nonclinical samples [10]. Kostić and Stanojević 's research showed that the reliability of the public self-absorption was α=0.75 and α=0.72 for the private self-absorption in a Serbian adult sample [11]. Fausor et al. [12]'s study in a Spanish community sample of adults also found that the SAS was reliable (alphas/omegas=.70 −.88 for the total and two subscales) and valid in terms of its correlations with depression and posttraumatic stress (r=.34 −.46).

Meanwhile, the structure of the SAS has been tested during its developmental procedure [10]. The two-factor structure of SAS was identified through exploratory factor analysis (EFA), and further confirmatory factor analysis (CFA) suggested that the two-correlated-factor model showed a better fit to the data than the single factor and two-uncorrelated-factor models. In the two-correlated-factor model, the eight private items had an average loading of 0.58, while the nine public items had

an average loading of 0.66, and there was a correlation of 0.67 between the two factors. In addition, the researchers discovered that the SAS showed good convergent and divergent validity when correlated with social anxiety (r_{PrSAS} = 0.32, r_{PubSAS} = 0.50) and depression (r_{PrSAS} = 0.35, r_{PubSAS} = 0.41).

As far as we know, previous research on the SAS has used samples from non-Chinese populations. Furthermore, there were no studies involving the construct of self-absorption in China. Therefore, the aim of this study is to introduce the SAS to mainland China and assess its latent variable structure, network structure, psychometric properties, and clinical utilities using a nonclinical sample in China.

EFA and CFA were used to evaluate the structure of the Chinese version of the SAS (CH-SAS) in two nonclinical Chinese samples. Given that gender differences were found in PrSAS [11], and that gender moderated the path coefficient from PrSAS to PubSAS in a mediation analysis study [13], it may be of interest to determinate if any of these differences were due to measurement bias for the latent constructs. However, so far as we know, there were no studies exploring the measurement equivalence of the SAS across gender. Thus, in this study, after evaluating the structure of the CH-SAS, its measurement invariance was further tested across gender in terms of configural invariance, metric invariance, scalar invariance and strict invariance. If shown to be invariant, reported gender differences in levels of self-absorption could be interpreted as true differences in the latent constructs rather than measurement artifacts [14].

Different from latent variable modeling (i.e., EFA and CFA), in the perspective of network analysis, items of a measure (or a subscale) are considered to constitute the corresponding construct rather than reflect it. With network analysis, the network structure of all the items of the CH-SAS can be investigated, and their relative importance can be estimated in terms of strength (i.e., the sum of absolute weighs of all direct edges between one item and other items), closeness (i.e., inverse sum of the shortest paths from one item to other items), betweenness (i.e., the frequency an item in the shortest path between two other items) and expected influence (i.e., the sum of weighs with signs for all direct edges between a given item and other items).

With respect to psychometric properties, both Cronbach's alpha [15] and McDonald's omega [16] were used to examine the internal consistency reliability of the CH-SAS. Assessment of the convergent validity of the CH-SAS was performed through the calculation of its

correlations with the Short General Health Questionnaire (GHQ-12) and the rumination subscale of the Rumination-Reflection Questionnaire (RRQ). According to a previous study, private self-absorption is more correlated with depression, while public self-absorption is more correlated with social anxiety [10], so the GHQ-12, which measures both depression and anxiety, was chosen to evaluate the convergent validity of the CH-SAS. Rumination refers to a habitual tendency to passively and repeatedly analyze one's problems, worries, and distressing emotions without taking any active steps toward resolving them [17, 18], which reflects the self-concern aspect of neuroticism [19]. Furthermore, the rumination subscale of the RRQ has been used to screen for subjects with a tendency toward self-absorption [20]. Therefore, the rumination subscale of the RRQ was also used to evaluate convergent validity for the CH-SAS.

Divergent validity was evaluated by calculating correlations of the CH-SAS with the Mindful Attention Awareness Scale (MAAS) and the Private Self-Consciousness Scale (PrSCS). Individuals who possess a high level of mindfulness tend to exhibit a greater awareness and attentiveness toward their present moment experiences, as opposed to individuals with self-absorption who are disconnected or disengaged from reality [21]. Leppanen and Kim's research demonstrated that absorption is linked to stimulus-driven focus and superficial self-reflection, whereas mindfulness involves goal-driven control over stimuli and insightful self-reflection [22]. Meanwhile, Perona-Garcelán et al.'s [23] study also suggested a negative correlation between self-absorption and mindfulness. Thus, the MAAS was used to test the divergent validity of the CH-SAS. When McKenzie and Hoyle [10] developed the SAS, they pointed out that the SAS measures pathological self-concern, which is different from the relatively simple construct of self-consciousness measured using the PrSCS. Therefore, we also used the PrSCS to assess the divergent validity of the CH-SAS.

Finally, we carried out an empirical study to illustrate the clinical utility of the CH-SAS. We explored the predictive role of self-absorption in obsessive-compulsive disorder (OCD) beyond other relevant psychological factors of dissociation, rumination, depression, anxiety, and mindful attention awareness. OCD is a type of anxiety disorder involving obsessive-compulsive thoughts and compulsive behaviors. People with OCD usually have recurrent and persistent, intrusive and inappropriate thoughts, impulses or images, sometimes with significant anxiety and distress in the process [24]. Previous studies have suggested that dissociation, rumination, anxiety and depression are all related to the development of OCD [25–30]. Self-absorption as measured by the SAS reflects pathological self-focus, with its construct sharing similarities with rumination [19]. Meanwhile, studies have

shown that self-absorption is related to depression and anxiety [10] as well as perfectionism, self-criticism, posttraumatic stress, anxious attachment and impairments in working memory capacity [12, 31–33], so it is reasonable to infer that self-absorption might also predict OCD to some extent. The exploration of the predictive role of self-absorption in OCD may inspire new treatment approaches.

Method

Participants
After completing the informed consent form, 209 participants provided responses in an online questionnaire system in exchange for a monetary incentive of 10 RMB. These participants were mainly recruited from Beijing (located in northern China) and Guangdong province (located in southern China). To ensure that respondents could fully understand the questions, participants with an educational level below junior high school were excluded, and those with too short response time were also excluded. In the end, data from 193 participants were kept (101 females, 92 males), with ages varying from 16 to 29 (mean=20.29; SD=1.92). To investigate the retest reliability of the CH-SAS, an additional 30 respondents (all college students) were contacted after the CH-SAS was obtained and asked to complete the Chinese version of the SAS and retest it 2 weeks later.

Assessment
Ember and Ember's [34] cross-cultural research approach was utilized to introduce the SAS to China. The English version of the SAS was first translated into Chinese by the authors. The back-translation was then carried out by an English lecturer. Professors and students with English language proficiency identified discrepancies between the back-translated SAS and original SAS, and made appropriate modifications to reduce them.

The GHQ-12 consists of 12 items describing the individual's life status, and participants are asked to report the degree of conformity based on the experience in the past four weeks. The GHQ-12 is scored on a 4-point Likert scale, with greater scores implying a more unfavorable state of mental health. The GHQ-12 has been used in China for decades [35, 36]. Li et al.'s [37] study revealed that the Cronbach's alpha coefficient of the Chinese version of the GHQ-12 was 0.87 in Chinese students aged between 12 and 19. Meanwhile, the GHQ-12 also demonstrated good internal consistency among Chinese civil servants (α=0.84) [38]. In addition, Wang et al. [39] observed a significant correlation of the Chinese version of the GHQ-12 with the Perceived Stress Scale (r=.49) as well as the General Self-Efficacy Scale (r=.31).

The rumination subscale of the RRQ [19] includes 12 items in total, scored on a 5-point Likert scale. Yuan et al.

[40] introduced the RRQ into China, and the rumination-reflection two-factor structure was supported using CFA. They also reported that the rumination subscale had a Cronbach's alpha coefficient of 0.81, and that the rumination subscale had a significant correlation with neuroticism ($r=.47$).

The MAAS [41] has 15 items that evaluate the level of awareness and attention in daily life based on a 6-point Likert scale, with higher scores indicating better awareness and attention in daily life. Chen et al. [42] introduced the MAAS to China, and found that the MAAS showed good test-retest reliability ($r=.87$) and internal consistency ($\alpha=0.89$). Additionally, the MAAS Chinese version was shown to have adequate divergent validity with the traits of anxiety ($r=-.27$) and depression ($r=-.31$), and acceptable convergent validity with self-esteem in a Chinese college student sample ($r=.15$).

The PrSCS is the subscale of the Self-consciousness Scale (SCS) [43] reflecting private self-consciousness, which consists of 10 items using a 5-point Likert scale. The SCS was revised by Scheier and Carber [44], and Chen et al. [45] introduced the revised version of the SCS to China. In a sample of Chinese college students, the PrSCS demonstrated satisfactory internal consistency ($\alpha=0.73$) and test-retest reliability ($r=.72$) [46].

The Obsessive-Compulsive Inventory-Revised (OCI-R) [47] is an 18-item self-report questionnaire that is scored on a 5-point Likert scale, with higher scores reflecting more obsessive-compulsive symptoms. The OCI-R has six subscales: washing, checking, ordering, obsessing, hoarding, and mental neutralizing. The total score for the Chinese version of the OCI-R showed a good level of internal consistency ($\alpha=0.88$) and acceptable convergent validity ($r=.42$) with the Yale-Brown Obsessive Compulsive Scale (Y-BOCS) in a Chinese college student sample [48].

The Dissociative Experiences Scale (DES-II) is designed based on the Diagnostic and Statistical Manual of Mental Disorders-III (DSM-III) diagnostic criteria, which includes 28 items [49]. Participants are asked to select the frequency with which each of the dissociative symptoms occurs, and each item is scored in 10% increments from 0 to 100%, with a total of 11 scoring levels. The DES-II score is obtained by dividing the total score by 28, with higher scores indicating more severe dissociative symptoms. Fang and Liu [50] introduced the DES-II to China, and demonstrated that DES-II had good reliability in a sample of Chinese college students. Specifically, the Cronbach coefficient α of the Chinese DES-II was 0.93, the split-half coefficient of Spearman-Brown was 0.88, and the test-retest reliability after 6 weeks was 0.84. After controlling for gender, the partial correlation coefficient of the scores of DES-II with the scores of the Stanford Group Hypnotic Susceptibility Scale Type C was 0.25

($p<.05$), and its partial correlation coefficient with the scores of the Tellegen Absorption Scale was 0.32 ($p<.05$), suggesting that DES-II had relatively good divergent and convergent validity.

Procedure and statistical analysis

First, the total sample was randomly divided into two halves, one for the EFA ($N=97$) and the other for the CFA ($N=96$). EFA was conducted first, and then CFA was used to test the factor structure obtained from the EFA. EFA was conducted with oblique rotation, and both EFA and CFA applied the MLR estimator. Furthermore, as a good rule of thumb, 0.30 was set as the minimum standardized loading for an item in factor analysis according to the McDonald criteria [16].

To evaluate the model fit for the CFA, the following fit indices and corresponding cutoff values were applied [51]: comparative fit index (CFI; more than 0.90/0.95 suggesting acceptable/good fit), the root mean square error of approximation (RMSEA; below 0.08 suggesting a good fit) with its 90% confidence interval, and Tucker–Lewis index (TLI; more than 0.90/0.95 suggesting acceptable/good fit). Then, the measurement invariance of the CH-SAS was assessed with respect to configural invariance, strong invariance, metric invariance, and strict invariance across genders. Changes in fit indices (e.g., ΔCFI<0.01, ΔTLI<0.01, ΔRMSEA<0.015) were also used when comparing nested models at a specific level in addition to ΔSB-χ2 [52–54].

When conducting network analysis, the 'least absolute shrinkage and selection operator' (LASSO) [55] was applied using the *qgraph* package of R [56] to obtain a sparse partial correlation network. With the R package *bootnet* [57], the bootstrapping technique (the number of nonparametric bootstrapping samples was set as 1000) was applied to obtain a 95% confidence interval (CI) of edge weights, and the stability of the centrality indices (i.e., strength, closeness, betweenness, and expected influence) was estimated using case-dropping bootstrapping (number of replicates=2500) [57]. The correlation stability (CS) indices were used to reflect the stability of the centrality indices, which is the maximum proportion of the sample that can be dropped to make the correlation of centrality indices in the subset with those in the original sample reach a certain value (i.e., 0.7 in this study). Epskamp et al. [57] pointed out that the minimum criterion for CS indices is 0.25, and they are recommended to be above 0.50.

The reliability of the CH-SAS was assessed using internal consistency in terms of Cronbach's alpha [15] and McDonald's omega [16], as well as test-retest reliability. Typically, a Cronbach's alpha of 0.70 or higher but less than 0.80 is considered to be acceptable, a value between 0.80 and 0.90 is considered to be good, and a value of

0.90 or above is considered to be excellent [58]. It was suggested that McDonald's omega assessed based on the saturation of general factors within a bifactor model can better reflect internal consistency [59], so it was also reported in this study. Although there were no widely acknowledged criteria for determining acceptable or satisfactory levels of McDonald's omega index, McDonald's omega index should adhere to the same standards as Cronbach's alpha coefficient. Test-retest reliability of 0.70 or higher is considered to be good [60].

We then evaluated the convergent and divergent validity of the CH-SAS by calculating its correlations with the rumination subscale of the RRQ, the GHQ-12, the MAAS, and the PrSCS.

Finally, a hierarchical regression analysis was carried out to explore the predictive role of self-absorption in OCD. In the final model, we used the OCI-R scores as the dependent variable, the CH-SAS scores as the focal predictor, the scores of dissociation, rumination, anxiety, depression, and mindfulness as the known predictors, and gender, age and educational level as covariates.

The factor analysis was conducted with Mplus 7 [61]. Cronbach's alpha calculations, correlation analyses and hierarchical regression were carried out with IBM SPSS Statistics for Windows version 26.0 [62]. The network analysis and McDonald's omega calculation were conducted with R [63].

Result
Structure
Exploratory factor analysis
In the EFA conducted on half of the whole sample (N=97), although there were four factors having eigenvalues greater than 1, the scree plot (shown in Figure S1) suggested that a two-factor solution was the most appropriate. All the items had primary loadings ranging from 0.397 to 0.775 on the factors (i.e., private self-absorption and public self-absorption) they were designed to measure, which were considered meaningful loading as defined by McDonald [16]. The correlation between the two factors was 0.56. However, the loadings of the tenth item (i.e., "When I start thinking about how others view me, I get all worked up.") on the two factors exceeded the cross-loading criterion of 0.4 suggested by Hair et al. [64], with a loading of 0.425 on the private self-absorption factor and a loading of 0.438 on the public self-absorption factor. Given that the overall focus of this question is on the extent to which one cares about "others' perceptions of one's self", we kept this question on the public self-absorption factor.

Confirmatory factor analysis
The two-correlated-factor model derived from the EFA model was tested through CFA on the other half of the sample (N=96) using the MLR estimator. The results showed that TLI=0.899, which closely reached the criterion of 0.9, and CFI=0.913 and RMSEA=0.057, which were in the ideal range.

The standardized factor loadings of the two factors are shown in Table 1. The standardized factor loadings of the 16 positively worded items ranged from 0.344 to 0.765, which were substantial and significant. The factor loading for the reverse-rated item (i.e., "I do not spend long amounts of time thinking about myself.") was poor (i.e., 0.044), which did not reach the criterion of 0.30 for a meaningful standardized factor loading [16]. Thus, this item was excluded from the CH-SAS.

Then, a two-correlated-factor model was applied to the remaining 16 positively worded items through CFA utilizing the MLR estimator. The results showed that the model fit indices satisfied the predetermined criteria (i.e., CFI=0.934, TLI=0.924, RMSEA=0.052) and that the factor loadings (range=0.344-0.766) were all significant and meaningful. In addition, to facilitate comparisons of self-absorption levels among this nonclinical Chinese sample and those in other cultural contexts, Table 1 displays the mean (M) scores and standard deviations (SD) for each item.

To further explore the invariance of the structure of the CH-SAS across gender, a multiple-group CFA was conducted to examine configural invariance, metric invariance, strong invariance, and strict invariance. Table 2 demonstrates the model fit indices for the nested models (Models 1–4). The goodness of fit indices for the configural invariance model were close to the desired criterion, with CFI, TLI, and RMSEA values of 0.875, 0.855, and 0.078, respectively. The chi-square difference test results indicated that there were no significant differences among each pair of nested models (Model 2 vs. Model 1: ΔSB-χ2 (14)=10.332, p>.05; Model 3 vs. Model 2: ΔSB-χ2 (14)=12.186, p>.05; Model 4 vs. Model 3: ΔSB-χ2 (16)=21.9622, p>.05). Additionally, the amount of variation in CFI, TLI and RMSEA between each pair of nested models did not exceed the suggested criterion, indicating that the strict invariance of the CH-SAS across different genders was supported.

Network analysis
The network structure of all the items for the CH-SAS is shown in Fig. 1. Overall, most items had one or more strong positive connections with other item(s) within the same subscale (i.e., PrSAS and PubSAS). Most connections between different subscale items were also positive, and they were often weaker than those within the same subscale. However, strong positive connections were found between "Sometimes I am so deep in thought about my life I am not aware of my surroundings" for the PrSAS and "It upsets me when people I meet don't like

Table 1 Descriptive statistics and standardized factor loadings of the two-correlated-factor model

Item	M	SD	Factor	
			PrSA	PubSA
Private self-absorption (PrSA)				
4. I think about myself more than anything else.	3.326	0.991	0.418***	
5. When I try to think of something other than myself, I cannot.	2.694	1.106	0.681***	
6. When I have to perform a task, I do not do it as well as I should because my concentration is interrupted with thoughts of myself instead of the task.	2.876	1.111	0.691***	
9. My mind never focuses on things other than myself for very long.	2.389	1.000	0.460***	
11. I cannot stop my head from thinking thoughts about myself.	2.751	1.186	0.744***	
12. Sometimes I am so deep in thought about my life I am not aware of my surroundings.	3.047	1.183	0.758***	
14. I do not spend long amounts of time thinking about myself.	3.332	1.002	0.044	
15. When I think about my life, I keep thinking about it so long I cannot turn my attention to tasks that need to be done.	3.010	1.127	0.687***	
Public self-absorption (PubSA)				
1. I find myself wondering what others think of me even when I don't want to.	3.741	0.944		0.366***
2. I have difficulty focusing on what others are talking about because I wonder what they're thinking of me.	3.187	1.034		0.517***
3. I feel like others are constantly evaluating me when I'm with them.	2.927	1.143		0.705***
7. I wish others weren't as critical of me as they are.	3.534	1.190		0.600***
8. I am very aware of what others think of me, and it bothers me.	2.964	1.062		0.765***
10. When I start thinking about how others view me, I get all worked up.	2.891	1.187		0.751***
13. It upsets me when people I meet don't like me.	3.212	1.208		0.633***
16. When I'm about to meet someone for the first time, I worry about whether they'll like me.	3.378	1.158		0.458***
17. After being around other people, I think about what I should have done differently when I was with them.	3.922	0.907		0.344***

Note *** *p* < .001

me" for the PubSAS, and "I think about myself more than anything else" for the PrSAS and "I wish others weren't as critical of me as they are" for the PubSAS. It should also be noted that "My mind never focuses on things other than myself for very long" in PrSAS and "After being around other people, I think about what I should have done differently when I was with them" in the PubSAS, and "When I have to perform a task, I do not do it as well as I should because my concentration is interrupted with thoughts of myself instead of the task" in the PrSAS and "I find myself wondering what others think of me even when I don't want to" in the PubSAS were strongly negatively connected.

The bootstrapped 95% CIs for edge weight estimates are shown in Figure S2. The strongest edges in terms of both sample estimates and bootstrapped means were PuS15 ("When I'm about to meet someone for the first time, I worry about whether they'll like me") - PuS16 ("After being around other people, I think about what I should have done differently when I was with them"), PuS1 ("I find myself wondering what others think of me even when I don't want to") - PuS16 ("After being around other people, I think about what I should have done differently when I was with them"), and PrS11 ("I cannot stop my head from thinking thoughts about myself") - PrS14 ("When I think about my life, I keep thinking about it so long I cannot turn my attention to tasks that need to be done").

The centrality estimates are shown in Fig. 2, and their corresponding stability is shown in Figure S3. The CS coefficients for strength, closeness, betweenness, and expected influence were 0.21, 0.05, 0, and 0.52, respectively, so only the order of expected influence can be interpreted properly according to the criterion set by Epskamp et al. [57]. As shown in Fig. 2, PrS12 ("Sometimes I am so deep in thought about my life I am not aware of my surroundings"), PrS11 ("I cannot stop my head from thinking thoughts about myself"), and PuS10 ("When I start thinking about how others view me, I get all worked up") had the strongest expected influence in the network.

Psychometric properties
Reliability analysis
Internal consistency was tested for the CH-SAS scale as a whole and its two subscales. The Cronbach's alpha values for the CH-SAS and the original SAS were 0.903 and 0.893, respectively. With respect to the internal consistency of the two subscales, the Cronbach's alpha values were 0.835 and 0.853 for the PrSAS and PubSAS, respectively. Due to certain limitations of Cronbach's alpha, we also computed McDonald's omega coefficients, which were 0.916, 0.875 and 0.883 for the CH-SAS, PrSAS and PubSAS, respectively.

Table 2 Overall model fit indices for the measurement invariance tests

Model	SB-X^2	df	CFI	TLI	RMSER [90% CI]	ΔCFI	ΔTLI	ΔRMSEA
Gender								
M1(configural)	327.493***	206	.875	.855	.078 [.062,.094]			
M2(metric)	341.389***	220	.875	.864	.076 [.060,.091]	0	.009	.002
M3(scalar)	350.759***	234	.880	.877	.072 [.056,.087]	−.005	.013	.004
M4(strict)	373.195***	250	.874	.879	.071 [.056,.086]	.006	.002	.001

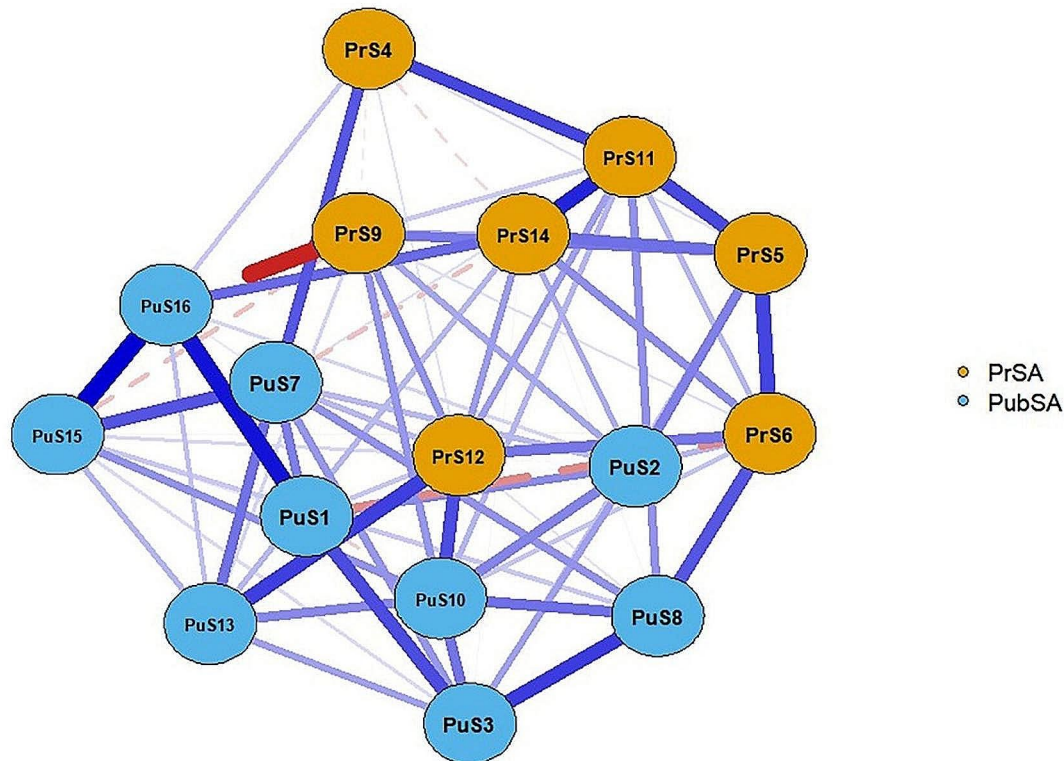*Note* M1-4 denotes Models 1–4; SB-χ2 = Satorra-Bentler chi-square; *** $p < .001$

Fig. 1 Estimated Network Structure for the CH-SAS items. The blue nodes were items of public SAS, and the yellow nodes were items of private SAS. PuS1 = "I find myself wondering what others think of me even when I don't want to"; PuS2 = "I have difficulty focusing on what others are talking about because I wonder what they're thinking of me"; PuS3 = "I feel like others are constantly evaluating me when I'm with them"; PrS4 = "I think about myself more than anything else"; PrS5 = "When I try to think of something other than myself, I cannot"; PrS6 = "When I have to perform a task, I do not do it as well as I should because my concentration is interrupted with thoughts of myself instead of the task"; PuS7 = "I wish others weren't as critical of me as they are"; PuS8 = "I am very aware of what others think of me, and it bothers me"; PrS9 = "My mind never focuses on things other than myself for very long"; PrS10 = "When I start thinking about how others view me, I get all worked up"; PrS11 = "I cannot stop my head from thinking thoughts about myself"; PrS12 = "Sometimes I am so deep in thought about my life I am not aware of my surroundings"; PuS13 = "It upsets me when people I meet don't like me"; PrS14 = "When I think about my life, I keep thinking about it so long I cannot turn my attention to tasks that need to be done"; PuS15 = "When I'm about to meet someone for the first time, I worry about whether they'll like me"; PuS16 = "After being around other people, I think about what I should have done differently when I was with them". The blue solid lines represent positive connections, the red dashed lines represent negative connections, and the thickness of the lines represents the magnitude of these connections

The results showed that the test-retest reliability of the CH-SAS after two weeks was 0.908. The test-retest reliability of the PrSAS and the PubSAS were 0.872 and 0.852, respectively.

Convergent and divergent validity

To evaluate the convergent and divergent validity of the CH-SAS, the Pearson's correlation coefficients of the CH-SAS with the rumination subscale of the RRQ, MAAS, GHQ-12 and PrSCS were calculated. The skewness (-0.368–1.174) and kurtosis (-1.17–0.537) for all
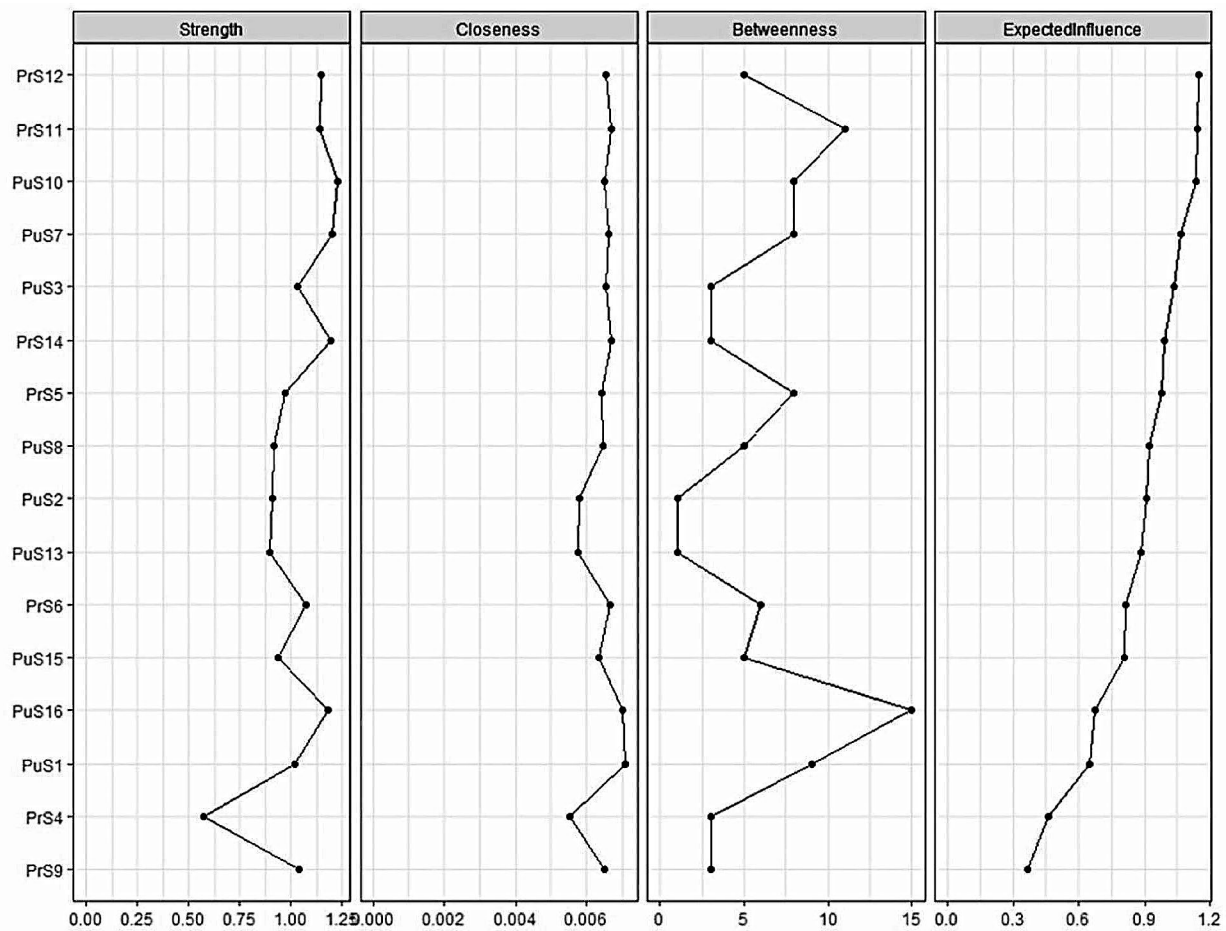
Fig. 2 The centrality estimates for the items of CH-SAS. The order of the items was ranked according to the expected influence indices

Table 3 Convergent and divergent validity for the CH-SAS

		CH-SAS			PrSCS	Rumination	MAAS	GHQ-12
		Entire	Private	Public				
Range		16–80	7–35	9–45	12–39	1.58-5	27–88	0–12
Mean		49.85	20.09	29.76	24.45	3.48	55.87	3.09
Skewness		0.105	0.138	-0.014	0.346	-0.137	0.074	1.174
Kurtosis		-0.039	-0.025	-0.027	0.097	-0.169	-0.321	0.537
Correlations	Entire		0.907***	0.937***	0.131	0.597***	− 0.413***	0.538***
	Private	0.907***		0.703***	0.078	0.474***	− 0.407***	0.518***
	Public	0.937***	0.703***		0.157*	0.616***	− 0.360***	0.479***

*Note * $p<.05$; *** $p<.001$*

measures satisfied the requirement for a normal distribution [65]. As shown in Table 3, the CH-SAS and its two subscales had moderate positive correlations with the rumination subscale of the RRQ (ranging from 0.474 to 0.616; $p<.001$) and the GHQ-12 (ranging from 0.479 to 0.538; $p<.001$), and moderate negative correlations with the MAAS (ranging from −0.413 to −0.360; $p<.001$). It is worth noting that the PrSCS has almost no correlation with the CH-SAS and PrSAS ($p>.05$). Although its correlation with the PubSAS was significant at the 0.05 level,

it was a remarkably low correlation coefficient ($r=.157$). To better illustrate the correlations of the CH-SAS with the depression, anxiety and social dysfunction dimensions of the GHQ-12, the correlations between the CH-SAS and these three subscales of the GHQ-12 are shown in Table 4. As shown in Table 4, the CH-SAS and its subscales were moderately correlated with the anxiety and depression subscales of the GHQ-12 (ranging from 0.405 to 0.505; $p<.001$), but they were uncorrelated with the social dysfunction dimension ($p>.05$).

Table 4 Correlations of the CH-SAS with subscales of GHQ-12

		GHQ-12		
		Anxiety	Depression	Social dysfunction
Correlations	Entire	0.485***	0.488***	0.089
	Private	0.459***	0.405***	0.118
	Public	0.433***	0.505***	0.039

Note *** $p < .001$

Hierarchical regression analysis

Before conducting hierarchical regression analysis, we first performed correlation analysis of OCD with dissociation, rumination, mindfulness, anxiety, depression and self-absorption to ensure that the cognitive predictors included in the hierarchical analysis were convincing. As shown in Table 5, dissociation, rumination, anxiety, depression and self-absorption were positively correlated with OCD ($r = .433$-0.606, $p < .001$), whereas mindfulness was negatively correlated with OCD ($r = -.382$, $p < .001$).

Then, we explored the predictive role of self-absorption in OCD. Hierarchical regression analysis was performed with OCD as the dependent variable, dissociation, rumination, mindfulness, anxiety, depression and self-absorption as independent variables, and gender, age, and education level as control variables. As shown in Table 6, in the first step, the covariates (i.e., gender, age and education level) did not significantly explain the variance of the OCD. In the second step, the inclusion of dissociation, rumination, mindfulness, anxiety, and depression explained an additional 47.4% of the OCD variance ($F (5, 184) = 21.119$, $p < .001$). The introduction of self-absorption in the third step explained an additional 2.0% of the OCD variance ($F (1, 183) = 20.254$, $p < .001$). In the final model, after controlling for other cognitive predictors and covariates, only dissociation, rumination and self-absorption were significant predictors, and their standard regression coefficients were 0.309, 0.156, and 0.221, respectively.

Discussion

By conducting a systematic evaluation of the CH-SAS in terms of latent variable structure, network structure, psychometric properties, and clinical utilities, this study supported the suitability of this questionnaire for use in Chinese cultural contexts. According to the factor

Table 5 Correlations of OCD with relevant psychological factors

	Dissociation	Rumination	Mindfulness	Anxiety	Depression	Self-absorption
OCD	0.593***	0.479***	− 0.382***	0.474***	0.433***	0.606***

Note *** $p < .001$

Table 6 The results of hierarchical regression analysis

	Adjusted R^2	ΔR^2	F	B	S.E.	β	t
The first step	-0.011	0.005	0.297				
Gender				0.793	2.065	0.028	0.384
Age				-0.475	0.565	-0.065	-0.841
Education level				-0.132	2.131	-0.005	-0.062
The second step	0.456	0.474	21.119***				
Gender				0.845	1.536	0.030	0.550
Age				-0.171	0.424	-0.023	-0.404
Education level				1.517	1.599	0.054	0.949
Dissociation				0.232	0.039	0.391	5.926***
Rumination				4.499	1.229	0.229	3.662***
Mindfulness				-0.079	0.077	-0.066	-1.031
Anxiety				1.523	0.770	0.157	1.979*
Depression				0.946	0.855	0.086	1.107
The third step	0.474	0.020	20.254***				
Gender				1.133	1.514	0.040	0.748
Age				-0.046	0.420	-0.006	-0.110
Education level				0.526	1.613	0.019	0.326
Dissociation				0.183	0.042	0.309	4.327***
Rumination				3.059	1.318	0.156	2.320*
Mindfulness				-0.065	0.076	-0.054	-0.855
Anxiety				1.411	0.758	0.146	1.862
Depression				0.436	0.861	0.040	0.507
Self-absorption				0.276	0.101	0.221	2.726**

Note * $p < .05$; ** $p < .01$; *** $p < .001$

analysis results, the CH-SAS had two correlated factors: private self-absorption and public self-absorption, which was consistent with the structure of the SAS during its developmental process [10]. However, the reverse scoring item in the original SAS should be dropped in the CH-SAS because of its extremely low factor loading on the corresponding factor in the CFA model. For Chinese individuals, this item (i.e., "I do not spend long amounts of time thinking about myself") appears to reflect a state of selflessness rather than the opposite of pathological self-absorption.

In addition to latent variable modeling, the network structure and importance of items for the CH-SAS were also estimated using network analysis. Consistent with the factor analysis results, most of the connections of items within the same subscale were stronger than those between different subscales. The strong positive connection between "Sometimes I am so deep in thought about my life I am not aware of my surroundings" for the PrSAS and "It upsets me when people I meet don't like me" for the PubSAS might reflect the aspects of self-absorption related to dissociation and anxiety, while the strong positive connection between "I think about myself more than anything else" for the PrSAS and "I wish others weren't as critical of me as they are" for the PubSAS might reflect the aspects of self-absorption related to narcissism. In the network of CH-SAS items, most of the connections were positive. However, two pairs of strong negative connections were found between different subscales. The reason might be that the negatively connected items might represent different aspects of self-absorption, which were those related to negative affect (e.g., anxiety and depression) and those related to narcissism. Self-absorption was found to be related to both negative affect (e.g., anxiety and depression [10]) and narcissism [13]. Narcissism is a multidimensional structure involving both adaptive and maladaptive components [13, 66]. Previous studies [67, 68] have shown that adaptive narcissism has a negative correlation with anxiety or depression, while maladaptive narcissism is uncorrelated or positively correlated with anxiety or depression. And self-absorption and narcissism share a component of pathological self-focused attention [13]. Therefore, it was inferred that the negative connections between items of the CH-SAS might be due to different psychological characteristics (i.e., negative affect or narcissism) related to these items.

The core items for the CH-SAS were "Sometimes I am so deep in thought about my life I am not aware of my surroundings", "I cannot stop my head from thinking thoughts about myself", and "When I start thinking about how others view me, I get all worked up", which seemed to be related to the aspects of excessive self-immersion, uncontrollability and anxiety for self-absorption.

The rumination subscale of the RRQ, MAAS, GHQ-12 and PrSCS were applied to examine the convergent and divergent validity of the CH-SAS. Consistent with expectations, the CH-SAS had a moderate positive correlation with the rumination subscale of the RRQ and the GHQ-12, a moderate negative correlation with the MAAS, and no correlation with the PrSCS, suggesting that the CH-SAS had favorable convergent and divergent validity.

Rumination reflects self-focused status in anxious individuals and is associated with psychological stress. Moreover, prior studies have found that rumination has positive correlations with negative emotions and mental illnesses [69–71]. Considering the sharing characteristics between rumination and self-absorption, the moderate positive correlation between the CH-SAS and the rumination subscale of the RRQ reflects the convergent validity of the CH-SAS.

In contrast, mindfulness emphasizes openness and acceptance [72, 73]. Individuals who have a high level of mindfulness tend to focus on reality, whereas individuals with a low level of mindfulness often have forced or automatic behaviors that lack consciousness or attentional involvement and may dwell on fantasies and anxieties regarding the past or the future [74]. This is similar to the psychological status and behavior of individuals with high levels of self-absorption who focus on the self excessively, continuously and pathologically and thus also lack awareness of reality. Therefore, the correlation coefficient between the CH-SAS and MAAS was negative.

Consistent with previous research [10], self-absorption was associated with depression and anxiety. Using the subscale of the GHQ-12, we also found that self-absorption had no significant correlation with social dysfunction, suggesting that self-absorption had no impact on individuals' social functions despite its negative impact on mental health.

Self-consciousness is an adaptive cognitive process involving inward attention to thoughts, feelings, or motivations [75]. The finding of a weak correlation between the PrSCS and the CH-SAS is consistent with the argument of Ingram [9] that self-absorption reflects pathological self-consciousness, which is different from the normal self-consciousness measured with the PrSCS.

There has been no research on the association between OCD and self-absorption, and the present study fills this gap. The results of the hierarchical regression analysis showed that the CH-SAS was sufficiently effective in predicting OCD. The results of the correlation analysis (i.e., OCD was moderately positively correlated with rumination, depression, and anxiety, and moderately negatively correlated with mindfulness) were identical to those of previous studies [25–30]. However, in the final results of the hierarchical regression analysis, only dissociation, rumination and self-absorption were

significant predictors for OCD after controlling for other psychological factors. Cognitive models of OCD suggest that obsessions are produced from unwanted intrusive thoughts or images that are considered important, unacceptable, or dangerous [76]. People with OCD are often out of the present moment, caught up in self-imagined obsessive-compulsive events, which makes them feel anxious as if these events have already occurred [77, 78]. In addition, Cartwright-Hatton and Wells [79] suggested that excessive awareness of and attention to one's cognitive processes can be used to differentiate between individuals with OCD and those suffering from generalized anxiety disorder. Similarly, higher levels of self-absorption represent a repetitive, passive approach to constantly focus on self while ignoring the surroundings, and they are associated with blurring the boundaries between the subjective and objective worlds [80]. Therefore, both OCD and self-absorption involve similar cognitive processes that are characterized by repetitiveness, uncontrollability, self-immersion, and cognitive fusion [78], which might explain the predictive role of self-absorption in OCD. Furthermore, in the hierarchical regression analyses, the effects of anxiety, rumination, and dissociation on obsessive-compulsive symptoms were attenuated when self-absorption was introduced. This suggests that self-absorption may partially mediate the relationship between these variables and OCD. Also, it was found that the self-absorption is more correlated with OCD than anxiety, which may suggest the potential role of self-absorption in differentiate OCD from other anxiety disorders. The unique influence of self-absorption in OCD may serve as an inspiration for the development of innovative treatments for this disorder. For example, self-related material can be incorporated into Attentional Bias Modification Training (ABMT) to effectively alter the pathological attentional processes observed in OCD patients [81–86].

In this study, it was observed that Chinese individuals exhibited higher scores on the self-absorption scale, compared to those obtained in the U.S. and Serbia [10, 11]. To be specific, in the Chinese sample, the average mean score of PrSAS items was 3.346, compared to 1.689 and 2.53 for the U.S. and Serbian samples, respectively. Similarly, the average mean score of PubSAS items was 3.301 in the Chinese sample, while it was 1.908 and 2.153 for the U.S. and Serbian samples, respectively. This disparity could potentially be attributed to profound cultural differences. For example, a pivotal element of Chinese culture is the concept of "Face-saving", which emphasizes the significance of preserving a positive image in the eyes of others. "Face-saving" has been linked to heightened levels of anxiety [87], as it entails a constant concern about how one's actions and behavior are perceived by society. This excessive preoccupation with others' opinions aligns closely with the core of public self-absorption. Furthermore, Confucianism, a foundational philosophy in Chinese society, upholds collectivism, encouraging individuals to prioritize the collective's well-being and opinion. This collectivistic mindset fosters a tendency for individuals to be more concerned about how the group views them [88, 89], thereby contributing to higher levels of public self-absorption. It should be noted that the majority of participants in this study were born during the period of China's one-child policy. Research [90] indicates that individuals from this demographic tend to be more self-oriented and less attentive to others' emotions, which may contribute to their increased levels of private self-absorption.

Although this study has made contributions, it is also important to acknowledge its limitations and address them in future research. First, as self-absorption is present in different types of psychological disorders [80], it is recommended to assess the psychometric properties of the CH-SAS in populations with varied clinical characteristics. Second, given that self-absorption is also correlated with some adaptive functions [80] in addition to the negative symptoms included in this study, we may include a comprehensive set of psychological variables that are related to self-absorption to gain more insight into the information contained in each item of the CH-SAS.

In summary, the CH-SAS is currently the only tool available to assess pathological self-absorption in nonclinical Chinese populations. It has a desirable structure and displays good reliability and validity in general. The specific items in the CH-SAS might be related to different psychological characteristics, but the core items of the CH-SAS were more related to excessive self-immersion, uncontrollability and anxiety aspects of self-absorption. Finally, self-absorption measured with the CH-SAS was able to effectively predict OCD beyond other relevant psychological factors, indicating the utility of the CH-SAS in Chinese cultural contexts.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12888-024-05999-3.

> Supplementary Material 1

Data availability
Availability of data and materialsThe study data is available from the corresponding author on application.

Declarations

Ethics approval and consent to participate
All participants have provided informed consent before the data collection. Participants were promised that the information provided would remain anonymous. The study was approved by Ethics Committee of Beijing University of Chinese Medicine (Approval No: 2023BZYLL1101). The ethical review was conducted in accordance with several key international and national guidelines, including the Declaration of Helsinki by the World Medical Association (2013), the International Ethical Guidelines for Human Biomedical Research by the Committee for International Organizations of Medical Sciences (2016), the Measures for Ethical Review of Biomedical Research Involving Human Beings issued by the National Health and Family Planning Commission (No. 11, 2016), and the Circular on the Issuance of the Measures for Ethical Review of Research in the Life Sciences and Medicine Involving Human Beings (2023). On logging on to complete the survey, participants were provided with a detailed information sheet concerning all aspects of the project. Participants then signalled their consent to take part in the study by clicking on the Proceed button.

Consent for publication
Not required as the manuscript does not contain individuals' data.

Competing interests
The authors declare no competing interests.

Author details
[1]School of Management, Beijing University of Chinese Medicine, Yangguang Street S., Fangshan District, Beijing 102488, China

References
1. Sedikides C, Skowronski JJ. The symbolic self in evolutionary context. Personality Social Psychol Rev. 1997;1:80–102.
2. Hoyle RH, Sowards BA. Self-monitoring and the regulation of social experience. A control process model. J Soc Clin Psychol. 1993;12:280–306.
3. Gregory B, Peters L. Unique relationships between self-related constructs, social anxiety, and depression in a non-clinical sample. Behav Change. 2017;34(2):117–33.
4. Heggeness LF, Paulus DJ, Vidaurri DN, Franklin CL, Raines AM. Depressive symptomatology and alcohol misuse among treatment-seeking military veterans: indirect associations via ruminative thinking. Addict Behav, 2021;112(1).
5. Watkins E, Teasdale JD. Adaptive and maladaptive self-focus in depression. J Affect Disord. 2004;82:1–8.
6. Baumeister RF. Escaping the self: Alcoholism, spirituality, masochism, and other flights from the burden of selfhood. New York: Basic Books; 1991.
7. Batmaz S, Altinoz AE, Sonkurt HO. Cognitive attentional syndrome and metacognitive beliefs as potential treatment targets for metacognitive therapy in bipolar disorder. World J Psychiatry. 2021;11(9):589–604.
8. Teasdale JD, Green HAC. Ruminative self-focus and autobiographical memory. Pers Indiv Differ. 2004;36:1933–43.
9. Ingram RE. Self-focused attention in clinical disorders: review and a conceptual model. Psychol Bull. 1990;107:156–76.
10. McKenzie KS, Hoyle RH. The self-absorption scale: reliability and validity in non-clinical samples. Pers Indiv Differ. 2008;45(8):726–31.
11. Kostić SM, Stanojević D. Validation of the Serbian adaptation of the self-absorption scale. Primenjena Psihologija. 2022;15(1):119–45.
12. Fausor JMMR, Sanz-García A, García-Vera MP, Sanz J. Validity evidence for the self-absorption scale (SAS) in Spanish population. Psicothema. 2024;36(1):64.
13. Barnett MD, Sharp KJ. Narcissism, gender, and evolutionary theory: the role of private and public self-absorption. Pers Indiv Differ. 2017;104:326–32.
14. Byrne BM, Shavelson RJ, Muthén B. Testing for the equivalence of factor covariance and mean structures: the issue of partial measurement invariance. Psychol Bull. 1989;105:456–66.
15. Cronbach LJ. Coefficient alpha and the internal structure of tests. Psychometrika. 1951;16:297–334.
16. McDonald RP. Test theory: a unified treatment. Mahwah, NJ: Lawrence Erlbaum; 1999.
17. Nolen-Hoeksema S, Wisco BE, Lyubomirsky S. Rethinking rumination. Perspect Psychol Sci. 2008;3(5):400–24.
18. Watkins ER. Constructive and unconstructive repetitive thought. Psychol Bull. 2008;134(2):163.
19. Trapnell PD, Campbell JD. Private self-consciousness and the five-factor model of personality: distinguishing rumination from reflection. J Personal Soc Psychol. 1999;76(2):284.
20. Ray RD, Ochsner KN, Cooper JC, Robertson ER, Gabrieli JD, Gross JJ. Individual differences in trait rumination and the neural systems supporting cognitive reappraisal. Cogn Affect Behav Neurosci. 2005;5:156–68.
21. Martin JR, Mindfulness. A proposed common factor. J Psychother Integr. 1997;7:291–312.
22. Leppanen ML, Kim K. Absorption and mindfulness reflect distinct patterns of attentional control and self-related processing. J Individual Differences, 2021.
23. Perona-Garcelán S, García-Montes JM, López-Jiménez AM, Rodríguez-Testal JF, Ruiz-Veguilla M, Pérez-Álvarez M. Relationship between self-focused attention and mindfulness in people with and without hallucination proneness. Span J Psychol. 2014;17:E20.
24. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed. Washington, DC: Author; 2013.
25. Norton GR, Ross CA, Novotny MF. Factors that predict scores on the dissociative experiences Scale. J Clin Psychol. 1990;46:273–7.
26. Tibi L, Van Oppen P, van Balkom AJLM, Eikelenboom M, Rickelt J, Schruers KRJ, Anholt GE. The long-term association of OCD and depression and its moderators: a four-year follow up study in a large clinical sample. Eur Psychiatry. 2017;44:76–82.
27. Wahl K, Ertle A, Bohne A, Zurowski B, Kordon A. Relations between a ruminative thinking style and obsessive–compulsive symptoms in non-clinical samples. Anxiety Stress Coping. 2011;24(2):217–25.
28. Watkins ER. Depressive rumination and co-morbidity: evidence for brooding as a transdiagnostic process. J Rational-Emot Cognitive-Behav Ther. 2009;27(3):160–75.
29. Sideli L, Santoro G, Fontana A, Guglielmucci F, Caretti V, Schimmenti A. The relationship between obsessive-compulsive symptoms and dissociation: a systematic review and meta-analysis. J Trauma Dissociation. 2023;24(3):362–79.
30. Soffer-Dudek N. Obsessive-compulsive symptoms and dissociative experiences: suggested underlying mechanisms and implications for science and practice. Front Psychol. 2023;14:1132800.
31. Öngen DE. The relationships among self-absorption, self-criticism and perfectionism. Procedia-Social Behav Sci. 2015;191:2559–64.
32. Kim EY, Lee J. The effects of anxious attachment on Depression among College students: mediation effect of self-absorption. J Digit Convergence. 2020;18(7):255–63.
33. Fergus TA, Weinzimmer SA, Schneider SC, Storch EA. Associations between self-absorption and working memory capacity: a preliminary examination of a transdiagnostic process spanning across emotional disorders. J Anxiety Disord. 2021;83:102457.
34. Ember CR, Ember M. Cross-cultural research methods. 2nd ed. AltaMira; 2009.
35. Ip WY, Martin C. Psychometric properties of the 12-item General Health Questionnaire (GHQ-12) in Chinese women during pregnancy and in the postnatal period. Psychol Health Med. 2006;11(1):60–9.
36. Pan PC, Goldberg DP. A comparison of the validity of GHQ-12 and CHQ-12 in Chinese primary care patients in Manchester. Psychol Med. 1990;20(4):931940.
37. Li WH, Chung JO, Chui MM, Chan PS. Factorial structure of the Chinese version of the 12-item General Health Questionnaire in adolescents. J Clin Nurs. 2009;18(23):3253–61.
38. Ying L, Lei W, Yin X. The factor structure of the 12-item general health questionnaire (GHQ-12) in young Chinese civil servants. Health Qual Life Outcomes. 2016;14(1):136.
39. Wang J, Liu J, Huang M, Chen W. Revision of the General Health Questionnaire (GHQ-12): Reliability and Validity Analysis Based on item wording Effects, editors *Proceedings of the Twenty-first National Psychology Conference Abstracts* (pp. 1030–1031);2018.

40. Yuan L, Peng M, Huang JH, Zhou RL. The Chinese version of rumination-reflection questionnaire in college students: validity and reliability. Chin J Clin Psychol. 2010;06701–3. https://doi.org/10.16128/j.cnki.1005-3611.2010.06.032.

41. Brown KW, Ryan RM. The benefits of being present: mindfulness and its role in psychological well-being. J Personal Soc Psychol. 2003;84(4):822.

42. Chen SY, Cui H, Zhou RL, Jia YY. Revision of mindful attention awareness scale (MAAS). Chin J Clin Psychol. 2012;02148–51. https://doi.org/10.16128/j.cnki.1005-3611.2012.02.024.

43. Fenigstein A, Scheier MF, Buss AH. Public and private self-consciousness: Assessment and theory. J Consult Clin Psychol. 1975;43(4):522.

44. Scheier MF, Carber CS. The self-consciousness scale: a revised version for use with general populations. J Appl Soc Psychol. 1985;15:X87–99.

45. Chen LW, Wu JJ, Wang WC. Revision of the self-awareness scale. Annual Rev Test. 1990;37:211–6.

46. Jiang C. *A Revision of the Self-consciousness Scale and it's Correlative Research* (Master's degree thesis, Southwest University); 2007.

47. Foa EB, Huppert JD, Leiber S, Langner R, Kichic R, Hajcak G, Salkovskis PM. The obsessive-compulsive inventory: development and validation of a short version. Psychol Assess. 2002;14(4):485.

48. He QH, Peng ZW, Miao GD. Reliability and validity of the Chinese version of the obsessive-compulsive inventory-revised. J Clin Psychiatry 2012; (01), 27–30.

49. Carlson EB, Putnam FW. An update on the dissociative experiences Scale. Dissociation: Progress Dissociative Disorders. 1993;6(1):16–27.

50. Fang L, Liu XH. Detection of the reliability and validity of dissociation experience scale II. Chin J Tissue Eng Res, 2006;(42),1–4.

51. Hu LT, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Struct Equation Modeling: Multidisciplinary J. 1999;6(1):1–55.

52. Cheung GW, Rensvold RB. Evaluating goodness-of-fit indices for testing measurement invariance. Struct Equ Model. 2002;9:233–55.

53. Chen FF. Sensitivity of goodness of fit indices to lack of measurement invariance. Struct Equ Model. 2007;14:464–504.

54. Pendergast LL, Embse N, Kilgus SP, Eklund KR. Measurement equivalence: a non-technical primer on categorical multi-group confirmatory factor analysis in school psychology. J Sch Psychol. 2017;60:65–82.

55. Tibshirani R. Regression shrinkage and selection via the lasso. J Royal Stat Soc Ser B: Stat Methodol. 1996;58(1):267–88.

56. Epskamp S, Cramer AO, Waldorp LJ, Schmittmann VD, Borsboom D. Qgraph: Network visualizations of relationships in psychometric data. J Stat Softw. 2012;48:1–18.

57. Epskamp S, Borsboom D, Fried EI. Estimating psychological networks and their accuracy: a tutorial paper. Behav Res Methods. 2018;50:195–212.

58. Jiang XH, Shen ZZ, Zhang NN, Liao HX, Xu HY. Reliability and validity analysis of the questionnaire. Mod Prev Med. 2010;37(3):429–31.

59. Dunn TJ, Baguley T, Brunsden V. From alpha to omega: a practical solution to the pervasive problem of internal consistency estimation. Br J Psychol. 2014;105:399–412.

60. Webb NM, Shavelson RJ, Haertel EH. In: Rao CR, Sinharay S, editors. (Else vier) 4 Reliability Coefcients and Generalizability Theory, in Handbook of Statistics; 2006. pp. 81–124.

61. Muthén LK, Muthén BO, MPlus. Statistical analysis with latent variables–User's guide; 2012.

62. IBM Corp. IBM SPSS statistics for Windows, version 21.0. Armonk, NY: IBM Corp; 2012.

63. R Development Core Team. R: A language and environment for statistical computing; R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL http://www.Rproject.org;2008

64. Hair J, Anderson R, Tatham R, Black W. Multivariate Data Analysis with readings. 4th ed. Englewood Cliffs, N.J: Prentice-Hall; 1995.

65. Kim H. Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. Restor Dentistry Endodontics. 2013;38(1):52–4.

66. Lau KS, Marsee MA, Kunimatsu MM, Fassnacht GM. Examining associations between narcissism, behavior problems, and anxiety in non-referred adolescents. Child & Youth Care Forum. Volume 40. Springer US; 2011. pp. 163–76.

67. Raskin RN, Terry H. A principal components analysis of the narcissistic personality inventory and further evidence of its construct validity. *Journal of Personality and Social Psychology*, 1988;54, 890–902.Calhoun GB, Glaser BA, Stefurak T, Bradshaw CP. Preliminary validation of the narcissistic personality

68. Washburn JJ, McMahon SD, King CA, Reinecke MA, Silver C. Narcissistic features in young adolescents: relations to aggression and internalizing symptoms. J Youth Adolesc. 2004;33:247–60.

69. Silvia PJ, Eichstaedt J, Phillips AG. Are rumination and reflection types of self-focused attention? Pers Indiv Differ. 2005;38(4):871–81.

70. Takano K, Tanno Y. Self-rumination, self-reflection, and depression: self-rumination counteracts the adaptive effect of self-reflection. Behav Res Ther. 2009;47(3):260–4.

71. Cano-López JB, Garcia-Sancho E, Fernández-Castilla B, Salguero JM. Empirical evidence of the metacognitive model of rumination and depression in clinical and nonclinical samples: a systematic review and meta-analysis. Cogn Therapy Res, 2022;1–26.

72. Kabat-Zin J. Full catastrophe living: Usingthe Wisdom of your body and mind to face stress, Pain and Illness. Delacorte New Yor, 1990.

73. Whitfield T, Barnhofer T, Acabchuk R, Cohen A, Lee M, Schlosser M, Marchant NL. The effect of mindfulness-based programs on cognitive function in adults: a systematic review and meta-analysis. Neuropsychol Rev. 2022;32(3):677–702.

74. Deci EL, Ryan RM. Self-determination theory: when mind mediates behavior. J Mind Behav. 1980;1:33–43.

75. Duval S, Wicklund RA. A theory of objective self awareness. Academic; 1972.

76. Abramowitz JS, Taylor S, Mckay D. Obsessive-compulsive disorder. Lancet (London England). 2009;374(9688):491–9.

77. Herzberg KN, Sheppard SC, Forsyth JP, Credé M, Earleywine M, Eifert GH. The believability of anxious feelings and thoughts questionnaire (baft): a psychometric evaluation of cognitive fusion in a nonclinical and highly anxious community sample. Psychol Assess. 2012;24(4):877–91.

78. Xiong A, Lai X, Wu S, Yuan X, TangJ, Chen J, … Hu M. Relationship between cognitive fusion, experiential avoidance,and obsessive–compulsive symptoms in patients with obsessive–compulsive disorder.Frontiers in Psychology, 2021;12, 655154.

79. Cartwright-Hatton S, Wells A. Beliefs about worry and intrusions: the meta-cognitions questionnaire and its correlates. J Anxiety Disord. 1997;11(3):279–96.

80. Kállai J, Vincze G, Török IA, Hargitai R, Rózsa S, Hartung I, … Herold R. Cognitive gain or handicap: Magical ideation and self-absorption in clinical and non-clinical participants. Frontiers in Psychology, 2021;12, 613074.

81. Klawohn J, Hajcak G, Amir N, Kathmann N, Riesel A. Application of attentional bias modification training to modulate hyperactive error-monitoring in OCD. Int J Psychophysiol. 2020;156:79–86.

82. MacLeod C, Mathews A, Tata P. Attentional bias in emotional disorders. J Abnorm Psychol. 1986;95(1):15–20. https://doi.org/10.1037/0021.

83. MacLeod C, Rutherford E, Campbell L, Ebsworthy G, Holker L. Selective attention and emotional vulnerability: assessing the causal basis of their association through the experimental manipulation of attentional bias. J Abnorm Psychol. 2002;111(1):107.

84. Amir N, Najmi S, Morrison AS. Attenuation of attention bias in obsessive–compulsive disorder. Behav Res Ther. 2009;47(2):153–7.

85. Habedank I, Lennartz SJ, Arslan RC, Ertle A. Online attention bias modification for obsessive-compulsive disorder. A randomized controlled trial; 2017.

86. Tata PR, Leibowitz JA, Prunty MJ, Cameron M, Pickering AD. Attentional bias in obsessional compulsive disorder. Behav Res Ther. 1996;34(1):53–60.

87. Kong D, Won YLI, Dong X. Face-saving and depressive symptoms among US Chinese older adults. J Immigr Minor Health. 2020;22(5):888–94.

88. Luo A, He H, Mohamed S, Rosenheck R. Medical student attitudes towards people with mental illness in China: a qualitative study. Cult Med Psychiatry. 2018;42(3):535.

89. Ran MS, Hall BJ, Su TT, Prawira B, Breth-Petersen M, Li XH, Zhang TM. Stigma of mental illness and cultural factors in Pacific Rim region: a systematic review. BMC Psychiatry. 2021;21:1–16.

90. Fan C-R, Wan C-W, Lin K-B, Qi-Cheng, Jing. A comparative study of personality qualities of only and non-only children among primary school students in Xi'an. Psychol Sci. 1994;0210.16719/j.cnki.1671-6981.1994.02.002.

inventory-juvenile offender. *International Journal of Offender Therapy and Comparative Criminology* 2000;44, 564–580.

Publisher's Note