Factorial validity of a substance-use stigma scale in methamphetamine-using adults in China

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Abstract

Background: Despite the large number of individuals who use substances of abuse and the stigma of such behaviors in China, scales have not been developed and validated for assessing substance-use stigma. Given its importance for targeting interventions, the aim of the present study was to validate a Chinese substance-use stigma measure including three dimensions of substance-

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use-disorder-related stigma (personal stigma, perceived stigma and social distance) by modifying a pre-existing scale measuring mental illness-related stigma and social distance.

Methods: A convenience sample of eight-hundred-and-twelve individuals with substance abuse (aged 18-68 years) from different drug rehabilitation centers completed a self-reported survey including their demographics and drug use, and the stigma and social distance scales. The adapted, translated from English to Chinese, and back-translated scales were an 18-items stigma scale including personal stigma and perceived stigma subscales and a 5-items one domain social distance scale. Confirmatory factor analysis and multigroup confirmatory factor analysis tested factorial validity and measurement invariance of the scales, respectively.

Results: For the stigma scale, by deleting one low correlation dimension (named "weak-not-sick"), personal stigma and perceived stigma showed acceptable fit indices and internal consistency with two dimensions (named "dangerous/unpredictable" and "social discrimination"), separately. The social distance scale showed good fit indices and internal consistency as a separate facet of stigma-related substance-use problems. Invariance of the model across drug-rehabilitation centers was found.

Conclusions: The Chinese substance-use stigma scale may serve as a valuable tool for better understanding substance-use stigma among adults in China who abuse substances.

1.   Introduction

Substance-use disorders (SUDs) have been described as chronic, relapsing illnesses characterized by compulsive drug use despite adverse consequences (Rinaldi et al. 1988). By the end of 2017, 2.553 million individuals in China were registered as having abused drugs, representing an increase of 1.9% over the prior year (NNCC 2017). Despite this growth, a large gap exists between the number of individuals with these disorders and the number receiving treatment. In order to reduce barriers to treatment, a major priority has been proposed to understand and decrease stigma related to SUDs (McFarling et al. 2011, NIDA 2016).

Stigma was defined by Goffman in 1963 as an "attribute that is deeply discrediting" and reduced the bearer "from a whole and usual person to a tainted, discounted one" (Goffman 1963). Since then, a stigma conceptualization has been ascribed to multiple circumstances including urinary incontinence (Sheldon and Caldwell 1994), leprosy (Opala and Boillot 1996), cancer (Fife and Wright 2000), and mental disorders (Jo C. Phelan et al. 2000, Corrigan et al. 2004, Griffiths et al. 2006, Calear et al. 2011). Health-related stigma has been described as involving the co-occurrence of labeling, stereotyping, separating, status loss, and discrimination related to a specific disease in the context of power imbalance (Link and Phelan 2001). Multiple different facets of mental illness stigma have been identified (Rüsch et al. 2005), including personal stigma, perceived stigma, internalized self-stigma, perceived dangerousness, desire for social control, and desire for social distance (Jorm and Oh 2009). These facets may also apply to substance-use stigma.

In China, stigmatization toward people with SUDs is a considerable problem (Luo et al. 2014, van Boekel et al. 2013), and it is often more severe than stigma related to other psychiatric disorders (Corrigan et al. 2005, Corrigan et al. 2006). Negative consequences associated with stigma for SUDs are notable, including delayed treatment-seeking (Semple et al. 2005, McFarling et al. 2011), reduced mental and physical health (Ahern et al. 2007), delayed recovery (Luoma et al. 2007), poorer social relationships, unemployment, and increased shame among individuals with substance abuse and their family members (Corrigan et al. 2006). Despite the potential impact of SUD-related stigma, research on this area is limited, particularly in China.

Stigma may arise from the convergence of interrelated components that include labeling (highlighting and defining human differences), stereotyping (using labels focusing on undesirable elements), separating (using labels describing individuals as belonging to "out-groups"), and discriminating (using labels to generate status loss), with a power structure allowing these processes to exist and propagate (Link and Phelan 2006). Few studies have investigated SUD-related stigma in China. The negative attitudes towards individuals with SUDs have been found to be widespread, and most Chinese people have labeled an individual with a SUD as an "addict", rated such individuals as having undesirable characteristics, and reported a strong desire for social distance (Link and Phelan 2006). Cultural factors have been implicated in the internalization of SUD-related stigma (Mak et al. 2015). However, the lack of a reliable validated instrument in Chinese makes it difficult to examine the impact of stigma towards substance abuse in people with substance-use problems in China.

Relatively few SUD-related stigma measures with acceptable psychometric properties exist. The Perceived Stigma of Addiction Scale (PSAS) (Luoma et al. 2010) is an 8-item scale that was adapted from an initial 12-item scale measuring perceived stigma toward serious mental illness (Link et al. 1997). In the revised scale, "someone who has been treated for substance use" replaced references to mental illness, and the scale was administered to a sample of individuals in treatment for substance abuse to measure perceived stigma among them. By deleting three low-fit rating items and one low-correlation item, the final PSAS consisted of eight items with one factor. While the scale has demonstrated acceptable internal consistency (α=0.73) (Luoma et al. 2010), it assesses only perceived stigma and may not adequately reflect other dimensions of the stigma of addiction. Brown (Brown 2011) measured three components of substance-use-related stigma using the Social Distance Scale for Substance Users (SDS-SU), Dangerousness Scale for Substance Users (DS-SU) and Affect Scale for Substance Users (AS-SU), which were adapted from measures of stigma related to mental illness (Link et al. 1999, Penn et al. 1994). College students completed these three measures, and the SDS-SU and AS-SU, but not the DS-SU, demonstrated good internal consistency and limited redundancy with the mental-illness versions (Brown 2011). However, Brown's study focused on the use of alcohol and marijuana, but not other more severe form of substance use, such as heroin and methamphetamine use. The Substance Use Stigma Mechanisms Scale (SU-SMS) is an 18-item scale which quantifies enacted, anticipated and internalized substance-use stigma mechanisms among individuals with a range of SUDs (Smith et al. 2016). The SU-SMS assesses enacted and anticipated stigma from relevant stigma sources (i.e., family members and healthcare workers); however, as this

scale was tested in a moderately sized sample, its stability warrants further investigation in a larger sample.

The aim of this study was to generate psychometrically acceptable SUD-related stigma measures in Chinese, which were adapted from the Depression Stigma Scale (DSS). (Griffiths et al. 2004) and the social distance scale (Link et al. 1999), in order to assess stigma for SUDs in individuals with substance-use problems. The DSS assessed two stigma domains, personal stigma and perceived stigma. Personal stigma reflects an individual's own stigmatizing attitudes, and perceived stigma reflects the perception that members of a stigmatized group have about the stigmatizing attitudes and actions that the society may have towards them (Link 1987). The DSS was first created with the initial aim to assess stigmatizing attitudes among people who screened positive for depression. Items were derived from major recurring broad themes extracted from websites on depression and stigma. Principal component analysis showed that the scale had two facets, personal stigma and perceived stigma. Social distance reflects the desire to avoid contact with a particular group of people (i.e., mental illness). The DSS and social distance scale were then well used in measuring stigmatizing attitudes towards mental disorders in a wide range of population (e.g. high school students, general population, professionals) (Nicola J Reavley and Jorm. 2011, Yoshioka et al. 2014, Reavley et al. 2014) across different cultures (Griffiths et al. 2006). Personal stigmatizing attitudes in individuals with mental disorders may reduce willingness for help-seeking (Schomerus et al. 2012, Griffiths et al. 2011), perceived stigma may lead to treatment discontinuation and reduced social interactions with others (Perlick et al. 2001, Sirey et al. 2001). These adverse effects may also apply to individuals with substance-use problems. Of note, social distance between how individuals with substance abuse perceive others with SUDs could be a fundamental aspect to consider within the social motives that drive behavior toward use of substances, as it has been argued that peer influence are main factors for initiation and maintenance of SUDs (Sherman et al. 2008, Kandel et al. 1992). Therefore, understanding the attitudes that individuals with substance abuse have toward SUDs and the attitudes they perceive from others, and the social distance between how individuals with substance abuse perceive others with SUDs could potentially better help target interventions that promote treatment initiation and engagement, recovery and social integration.

Hence, we sought to evaluate on a sample of Chinese individuals with substance abuse, three dimensions of SUD-related stigma (personal stigma, perceived stigma and social distance) by modifying a pre-existing measure of mental illness-related stigma and social distance.

2. Material and methods

2.1. Participants and procedure

Eight-hundred-and-twelve individuals (695 male, 117 females, age range: 18-68 years) participated. They were recruited from three voluntary drug rehabilitation centers (two located in Changsha, one in Wuhan) and two compulsory drug rehabilitation centers (one in Changsha, one in Zhangzhou). All participants were provided information about the study, and were free to decline participation before they completed the survey. Oral consent to participate was obtained from each participant before they completed the survey.

A paper-based self-reported survey was provided to participants who gave their oral consent. Participants were informed that any information we obtained may be shared only with the head of research and the researchers involved in this study, who are bound by professional secrecy and required to comply with the legislation on the privacy protection. The survey was conducted between December 2015 and March 2018. The study was approved by the ethical review board of the Second Xiangya Hospital of Central South University, the ethical review board evaluated the study specifically related to participation of incarcerated individuals, and conditions for use of incarcerated individuals in research were met.

2.2. Measures

At the beginning of the questionnaire, participants were asked to provide information regarding their demographics and drug use (e.g., age of first-time methamphetamine use, they had used methamphetamine for how long, and how many times they had relapsed). The stigma and social distance scales we used were adapted and translated into Chinese by three of the authors, and back translated into English by a separate bilingual psychiatrist to help ensure the accuracy of the translation.

2.2.1. Stigma scale—Participants' stigma attitudes to SUDs were assessed by the stigma scale comprised of 18 items adapted from the DSS (Griffiths et al. 2004). The DSS assessed two stigma domains, personal stigma and perceived stigma, and each stigma domain was assessed using 9 items. In our adaptation, we replaced the word "depression" with the word "substance-use disorder" as appropriate. The personal stigma questions were asked as follows:

"Lisi is a person with a substance-use disorder, the drugs he mainly used were synthetic drugs, such as methamphetamine. The next few questions will ask you about your personal attitudes toward Lisi. Please select from strongly agree to strongly disagree for each question. 1. People with a problem like Lisi's could snap out of the problem if he/she wanted. 2. A problem like Lisi's is a sign of personal weakness. 3. A problem like Lisi's is not a real medical illness. 4. People with a problem like Lisi's are dangerous. 5. It's best to avoid people with a problem like Lisi's so that you don't develop this problem yourself. 6. A problem like Lisi's makes him/her unpredictable. 7. I would not tell anyone else if I had a problem like Lisi's. 8. I would not employ someone if I knew he/she had the problem like Lisi's. 9. I would not vote for a politician if I knew he/she had the problem like Lisi's."

The questions for perceived stigma involved the same items, but instead asking the participants' personal attitude, they were asked "what you think most other people's beliefs". Ratings were made on a 5-point Likert scale from "strongly agree" to "strongly disagree". In Yoshioka's model (Yoshioka et al. 2014), the authors found "weak not sick" (consisting of items 1~3) and "dangerous/unpredictable" (consisting of items 4~7) factors when assessing for personal and perceived stigma using an adapted version for young people (Jorm and Wright 2008). In our study, we used the complete scale with two more items on employing and voting for each stigma domain, and preliminary analyses using our sample suggested a third factor for these two items; we named this factor as "social discrimination" (consisting of item 8~9). Taken together, in the present study, we decided to test for the

three-factor structure for both personal and perceived stigma. Scores on each stigma domain ranged from 0 to 36, with higher scores indicating greater stigma.

2.2.2.   Social distance scale—Participants' self-reported willingness to have contact with SUDs were assessed by a social distance scale adopted from the scale developed by Link et al. (Link et al. 1999). The items were rated according to how willing participants would be to engage in five social contexts with people with SUDs including: 1) move next door, 2) spend an evening socializing, 3) make friends, 4) work closely, and 5) marry into the family. Responses were made on a 4-point Likert scale from "definitely willing to" to "definitely unwilling to". Scores for each item were summed and divided by 5, with total scores ranging from 1 (low social distance) to 4 (high social distance).

2.3.   Statistical analysis

First, a confirmatory factor analysis (CFA) using the Lavaan package (Rosseel 2012) of R software (R Development Core Team 2018) was conducted. The fit of the general model was assessed using the following indices: Chi square (χ^2), Comparative Fit Index (CFI; values between 0.95~0.97 were considered as indicating acceptable fit, greater than 0.97 as good fit), Tucker Lewis Index (TLI; values between 0.95~0.97 were considered as indicating acceptable fit, greater than 0.97 as good fit), and Root Mean Square Error of Approximation (RMSEA; values between 0.05~0.08 were considered as indicating acceptable fit, lower than 0.05 as good fit) (Schermelleh-Engel et al. 2003). Cronbach's α was used to assess internal consistencies of the scales and its dimensions (values between 0.70~0.80 were considered as acceptable, between 0.80~0.90 were considered as good, and greater than 0.90 as excellent) (Streiner 2003). When finishing the first CFA, we found the Cronbach's α was unacceptable. We then checked the correlation of each item with other items and the total score, removed the items with low correlations with other items and the total score (R<0.30) (Tavakol and Dennick 2011) and generated a new model. Another CFA was conducted with the new model.

Second, the new model was tested independently for both voluntary and compulsory drug rehabilitation centers to assess configural invariance. A multigroup CFA was conducted to assess measurement invariance of the scale across different drug rehabilitation centers. Next, a hierarchical approach was adopted to constrain model parameters and compare changes in model fit. Configural, metric and scalar models were estimated. Measurement invariance was evaluated by both the change in model fit indices (i.e.,　CFI larger than 0.01 and 　RMSEA lager than 0.015 were considered as indicative of non-invariance; (Cheung and Rensvold 2002)) and multigroup model fit indices.

3.   Results

Of the 812 participants, 794 (97.8%) completed the stigma and social distance scales, 784 (98.8%) out of the 794 participants used methamphetamine and were included in the final analyses. Descriptive statistics of socio-demographic, drug-use measures, stigma and social distance scores, and the differences between the voluntary versus compulsory drug rehabilitation centers are shown in Table 1. Individual's age at first-time methamphetamine

use ranged from 11-50 years; the number of relapses ranged from 0-10 times; and period of methamphetamine use ranged from 1-227 months.

Results of the CFA for the stigma general model (model 1) showed a good fit index but poor internal consistency with respect to the observed data (personal stigma: $\chi^2(24)=54.878$, $p<0.001$, CFI=0.971, TLI=0.957, RMSEA=0.041 90%CI=0.026 0.055, Cronbach's $\alpha=0.36$; and perceived stigma: $\chi^2(24)=100.875$, $p<0.001$, CFI=0.966, TLI=0.949, RMSEA=0.064 90%CI=0.051 0.077, Cronbach's $\alpha=0.50$) (Table 2). We then computed the correlation of each item with other items and the total score for each stigma (Table 3 for personal stigma, Table 4 for perceived stigma), found that the first three items (consisting of the "weak-not-sick" factor) had low correlations with other items and the total score (R<0.30). The first three items were removed and a new model generated with two factors (model 2). Results of the CFA for stigma model 2 showed a good fit index and internal consistency (personal stigma: $\chi^2(8)=15.612$, $p=0.048$, CFI=0.992, TLI=0.985, RMSEA=0.035 90%CI=0.003 0.060, Cronbach's $\alpha=0.71$; and perceived stigma: $\chi^2(8)=20.078$, $p=0.010$, CFI=0.994, TLI=0.989, RMSEA=0.044 90%CI=0.020 0.068, Cronbach's $\alpha=0.85$) (Table 2). Standardized loadings in model 2 ranged between 0.23 and 0.82 for personal stigma and 0.43 and 0.88 for perceived stigma (Table 5).

Results of the correlation of each item with other items and the total score for social distance were showed in Table 6. Results of the CFA for social distance showed a good fit index and internal consistency ($\chi^2(5)=40.233$, $p<0.001$, CFI=0.985, TLI=0.971, RMSEA=0.095 90%CI=0.069 0.123, Cronbach's $\alpha=0.89$) (Table 2). Standardized loadings ranged between 0.56 and 0.89 (Table 5).

The new model (model 2) was estimated in voluntary and compulsory drug rehabilitation centers separately before testing the measurement invariance. Results (Table 7) showed that the model fit was adequate to good for both voluntary (personal stigma: $\chi^2(8)=9.466$, $p=0.304$; CFI=0.998; TLI=0.996; RMSEA=0.017 90%CI=0.000 0.053; perceived stigma: $\chi^2(8)=23.231$, $p=0.003$; CFI=0.991; TLI=0.984; RMSEA=0.056 90%CI=0.030 0.083; and social distance: $\chi^2(5)=31.023$, $p<0.001$; CFI=0.987; TLI=0.973; RMSEA=0.093 90%CI=0.063 0.125) and compulsory (personal stigma: $\chi^2(8)=17.737$, $p=0.023$, CFI=0.950, TLI=0.907, RMSEA=0.082 90%CI=0.029 0.134; perceived stigma: $\chi^2(8)=22.865$, $p=0.004$, CFI=0.960, TLI=0.924, RMSEA=0.101 90%CI=0.054 0.151; and social distance: $\chi^2(5)=15.650$, $p=0.008$, CFI=0.977, TLI=0.953, RMSEA=0.108 90%CI=0.050 0.171) drug rehabilitation centers. The fit indices of the unconstrained multigroup model indicated the configural invariance of the factor structure was similar across drug rehabilitation centers (personal stigma: $\chi^2(16)=27.203$, $p=0.039$, CFI=0.988, RMSEA=0.042 90%CI=0.009 0.069; perceived stigma: $\chi^2(16)=46.096$, $p<0.001$, CFI=0.986, RMSEA=0.069 90%CI=0.046 0.093; and social distance: $\chi^2(10)=46.673$, $p<0.001$, CFI=0.985, RMSEA=0.097 90%CI=0.070 0.126). Metric invariance was tested subsequently by constraining all item loadings to be equal across drug rehabilitation centers, and no significant reduction in model fit was found (personal stigma: CFI=−0.001, RMSEA=0.005; perceived stigma: CFI=0.001, RMSEA=0.006; social distance: CFI=0.000, RMSEA=0.017). Finally, scalar invariance was tested by constraining all item intercepts to be equal across drug rehabilitation centers (personal stigma: CFI=0.001,

RMSEA=0.003; perceived stigma: CFI=0.004,   RMSEA=−0.003; social distance:
CFI=0.002,   RMSEA=0.004).

4.   Discussion

The aim of the present study was to evaluate the psychometric properties of a new multi-dimensional stigma measure in the context of SUDs on individuals with substance-use problems. Using the pre-existing mental illness-related stigma and social distance measures, we established a measure of stigma in the context of SUDs with different stigma sources, i.e. personal stigma, perceived stigma, and social distance, presenting acceptable psychometric properties. In Yoshioka's model, the authors found "weak not sick" and "dangerous/unpredictable" for both personal and perceived stigma toward mental disorders, using an adapted version for young people (Yoshioka et al. 2014). Different from Yoshioka's model, we found that in individuals with substance abuse, in the personal and perceived stigma scale, the items relating to the "weak-not-sick" dimension had low correlations with other items and the total score. After removing these items, CFA revealed good fit index and internal consistency with two dimensions ("dangerous/unpredictable" and "social discrimination") for each stigma scale. In addition, we found that the social distance scale had a good fit index and internal consistency as a separate construct of stigma for SUDs, which replicated and extended previous findings in the context of mental disorders (Jorm and Wright 2008). Lastly, results of the multigroup analysis suggested the invariance of the model across drug rehabilitation centers.

The reason underlying the lack of identification of the "weak-not-sick" factor warrants consideration. In our study, all participants had substance-use problems and were recruited from treatment centers, and some had experienced prior relapses. It is thus likely that they could acknowledge the difficulties relating to ceasing to use drugs and the importance of seeking medical help. The current sample reported predominantly problems with methamphetamine use. Unlike the case for many other drugs (e.g., opioids), there is a tendency for individuals using methamphetamine to experience drug-related psychosis (Farrell et al. 2002), which may more readily be identified by individuals as a "sickness". In the past two decades, the brain disease model of addiction has been accepted by many, including in China (Volkow et al. 2016). These considerations may in part explain why the "weak-not-sick" dimension did not fit well in the present study; however, direct investigation of these possibilities is warranted.

While compulsory drug rehabilitation centers are common throughout East and Southeast Asia, their effectiveness is controversial (Werb et al. 2016). Some data suggest that relapse rates of individuals released from compulsory drug rehabilitation centers are high (Wegman et al. 2017), and stigma and discrimination may represent potential precipitants of relapse (Yang et al. 2015). Results of the multigroup analysis in the present study support the potential utility of the SUD-related stigma measure in relapse prevention programs in order to better understand which facets of SUD-related stigma may relate to relapse and how to reduce SUD-related stigma in order to help individuals maintaining abstinence, thus improving health outcomes and well-being.

Despite the psychometric strengths of this new SUD-related stigma measure, several limitations of the current study should be considered. We only included SUD-related personal stigma, perceived stigma and social distance in this measure, future work could consider assessing additional facets of SUD-related stigma, such as self-esteem, internalized self-stigma and anticipated stigma. We mainly investigated individual's stigma attitude towards synthetic drug use. Attitude towards alcohol drinking, cigarette use, heroin use, and behavioral addictions could differ, it is necessary to investigate this measure relative to other addictive behaviors. While the scales operated well with respect to psychometric properties, some aspects of stigma may not have been optimally assessed. For example, "perceived stigma" measures were focused on how "most other people" viewed SUDs, they did not assess "felt stigma" *per se*. While our sample size was considerable and well suited for CFA (Wolf et al. 2013), the limited number of female participants restricted us to test the measurement properties across groups. Future studies should investigate possible gender-related differences. Our sample consisted predominantly of individuals with problems of methamphetamine use, reflective of current drug-use trends in China (NNCC 2017). The extent to which the findings relate to groups with other drug-use problems or addictive behaviors warrants additional study. We studied individuals in treatment for substance-use problems. The extent to which the findings may extend to individuals with substance-use problems who are not in treatment should be examined in future studies. Thus, future work should consider validating this measure in other populations (including in community samples to determine relative sensitivity in different populations) and investigating the attitude towards other drug-use stigma, as well as examining other facets of stigma. Lastly, to our knowledge, there is no available Chinese instrument that measures SUD-related personal and perceived stigma and social distance. As such, we could not determine the extent to which different instruments measure the same construct in order to assess more fully construct validity.

5. Conclusions

The current work found this Chinese version of SUD-related stigma measure to be a reliable and valuable tool for assessing the stigmatizing attitudes towards SUDs, particularly towards synthetic drugs, in individuals with substance-use problems. Notwithstanding the above limitations, this measure is positioned as a useful tool in assessing the clinical relevance of stigma as related to SUDs and developing promising interventions focused on reducing stigma and its impact. Such efforts are critical for reducing treatment barriers and optimizing relapse prevention programs in order to improve social and health outcomes.

Acknowledgments

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Highlights

- Personal and perceived stigma may influence people with stimulant-use disorders.

- The Chinese substance-use stigma scale had acceptable fit indices and internal consistency.

- The scale had dimensions of personal and perceived stigma.

- A social distance scale had a good fit index and internal consistency as a separate domain.

- Multi-group analysis suggested scale invariance across drug-rehabilitation centers.

Table 1

Descriptive statistics of socio-demographic, drug-use measures, stigma and social distance.

Socio-demographic characteristic	All (N=784)	Voluntary (N=603)	Compulsory (N=181)	F/χ²	*p*
Age, years (SD)	31.59 (7.16)	31.47(6.88)	31.98(8.03)	0.78	0.436
Education, years (SD)	10.89 (3.25)	11.38(3.29)	9.28(2.51)	−9.13	<0.001
Gender				173.53	<0.001
Male, N (%)	676 (86.22)	574(95.19)	102(56.35)		
Female, N (%)	108 (13.78)	29(4.81)	79(43.65)		
Marriage				32.89	<0.001
Currently married, N (%)	356 (45.41)	308(51.08)	48(26.52)		
Not married, N (%)	428 (54.59)	295(48.92)	133(73.48)		
Drug use measure					
Age at first-time methamphetamine use, years (SD)	24.19 (7.09)	24.00(6.94)	24.82(7.57)	1.30	0.194
Number of relapses, mean (SD)	1.36 (1.62)	1.29(1.60)	1.61(1.68)	2.26	0.025
Period of methamphetamine use, months (SD)	47.29 (36.31)	49.12(36.68)	41.19(34.45)	−2.67	0.008
Stigma					
Personal stigma, mean (SD)	22.92 (3.75)	22.81(3.77)	23.28(3.67)	1.51	0.131
Perceived stigma, mean (SD)	24.35 (3.56)	24.46(3.56)	23.96(3.55)	−1.69	0.092
Social distance, mean (SD)	3.04 (0.77)	3.05(0.81)	3.03(0.65)	−0.26	0.794

Table 2

Fit indices for the CFA model

Scales	χ^2 (p)	df	CFI	TLI	RMSEA (90%CI)	Cronbach's α
Model 1						
Personal stigma	54.878 (<0.001)	24	0.971	0.957	0.041 (0.026,0.055)	0.36
Perceived stigma	100.875 (<0.001)	24	0.966	0.949	0.064 (0.051,0.077)	0.50
Model 2						
Personal stigma	15.612 (0.048)	8	0.992	0.985	0.035 (0.003,0.060)	0.71
Perceived stigma	20.078 (0.010)	8	0.994	0.989	0.044 (0.020,0.068)	0.85
Social distance	40.233 (<0.001)	5	0.985	0.971	0.095 (0.069,0.123)	0.89

Table 3

Correlation of each item with other items and the total score of personal stigma scale

Variable	1	2	3	4	5	6	7	8	9	10
1.People could snap out of this kind of problem	-									
2.This kind of problem is a sign of personal weakness	0.04	-								
3.This kind of problem is not a real medical illness	0.11	0.18	-							
4.People with this kind of problem are dangerous	−0.15	−0.19	−0.19	-						
5.It's best to avoid people with this kind of problem	−0.12	−0.11	−0.13	0.43	-					
6.People with this kind of problem are unpredictable	−0.14	−0.16	−0.14	0.36	0.44	-				
7.I would not tell anyone if I had this kind of problem	−0.11	−0.04	−0.05	0.06	0.16	0.15	-			
8.I would not employ anyone with this kind of problem	−0.13	−0.17	−0.04	0.30	0.38	0.32	0.20	-		
9.I would not vote anyone with this kind of problem	−0.13	−0.13	−0.06	0.27	0.33	0.30	0.16	0.61	-	
10.Total personal stigma score	0.15	0.13	0.21	0.50	0.61	0.53	0.40	0.63	0.59	
Mean	2.31	1.82	2.08	2.68	2.83	2.78	2.68	2.87	2.96	22.92
SD	1.19	1.04	1.08	1.09	0.99	0.91	1.03	0.99	0.91	3.75

Table 4

Correlation of each item with other items and the total score of perceived stigma scale

Variable	1	2	3	4	5	6	7	8	9	10
1.People could snap out of this kind of problem	-									
2.This kind of problem is a sign of personal weakness	0.01	-								
3.This kind of problem is not a real medical illness	0.18	0.13	-							
4.People with this kind of problem are dangerous	−0.22	−0.20	−0.10	-						
5.It's best to avoid people with this kind of problem	−0.26	−0.10	−0.06	0.62	-					
6.People with this kind of problem are unpredictable	−0.30	−0.15	−0.10	0.62	0.63	-				
7.I would not tell anyone if I had this kind of problem	−0.23	0.08	−0.05	0.30	0.32	0.38	-			
8.I would not employ anyone with this kind of problem	−0.24	−0.09	−0.07	0.48	0.57	0.52	0.30	-		
9.I would not vote anyone with this kind of problem	−0.26	−0.12	−0.07	0.46	0.56	0.51	0.28	0.75	-	
10.Total perceived stigma score	0.03	0.20	0.28	0.62	0.69	0.65	0.53	0.69	0.66	-
Mean	1.49	1.67	2.02	3.28	3.29	3.19	3.05	3.14	3.21	24.35
SD	1.10	1.01	1.01	0.77	0.79	0.79	0.86	0.81	0.77	3.56

Table 5

Standardized factor loadings for the stigma and social distance scale

Items	Weak-not-sick	Dangerous/ unpredictable	Social discrimination	Social distance
Model 1				
Personal stigma				
1. People could snap out of this kind of problem	0.28	-	-	-
2. This kind of problem is a sign of personal weakness	0.37	-	-	-
3. This kind of problem is not a real medical illness	0.37	-	-	-
4. People with this kind of problem are dangerous	-	0.60	-	-
5. It's best to avoid people with this kind of problem	-	0.70	-	-
6. People with this kind of problem are unpredictable	-	0.63	-	-
7. I would not tell anyone if I had this kind of problem	-	0.23	-	-
8. I would not employ anyone with this kind of problem	-	-	0.82	-
9. I would not vote anyone with this kind of problem	-	-	0.74	-
Perceived stigma				
1. People could snap out of this kind of problem	0.55	-	-	-
2. This kind of problem is a sign of personal weakness	0.18	-	-	-
3. This kind of problem is not a real medical illness	0.26	-	-	-
4. People with this kind of problem are dangerous	-	0.76	-	-
5. It's best to avoid people with this kind of problem	-	0.81	-	-
6. People with this kind of problem are unpredictable	-	0.80	-	-
7. I would not tell anyone if I had this kind of problem	-	0.43	-	-
8. I would not employ anyone with this kind of problem	-	-	0.88	-
9. I would not vote anyone with this kind of problem	-	-	0.86	-
Model 2				
Personal stigma				
4. People with this kind of problem are dangerous	-	0.58	-	-
5. It's best to avoid people with this kind of problem	-	0.73	-	-
6. People with this kind of problem are unpredictable	-	0.62	-	-
7. I would not tell anyone if I had this kind of problem	-	0.23	-	-
8. I would not employ anyone with this kind of problem	-	-	0.82	-
9. I would not vote anyone with this kind of problem	-	-	0.74	-
Perceived stigma				
4. People with this kind of problem are dangerous	-	0.76	-	-
5. It's best to avoid people with this kind of problem	-	0.81	-	-
6. People with this kind of problem are unpredictable	-	0.79	-	-
7. I would not tell anyone if I had this kind of problem	-	0.43	-	-
8. I would not employ anyone with this kind of problem	-	-	0.88	-
9. I would not vote anyone with this kind of problem	-	-	0.86	-

Items	Weak-not-sick	Dangerous/ unpredictable	Social discrimination	Social distance
Social distance				
Move next door	-	-	-	0.80
Spend an evening socializing	-	-	-	0.88
Make friends	-	-	-	0.89
Work closely	-	-	-	0.82
Marry into the family	-	-	-	0.56

Table 6

Correlation of each item with other items and the total score of social distance scale

Variable	1	2	3	4	5	6
1.Move next door	-					
2.Spend an evening socializing	0.72	-				
3.Make friends	0.69	0.80	-			
4.Work closely	0.66	0.70	0.73	-		
5.Marry into the family	0.44	0.46	0.50	0.53	-	
6.Total social distance score	0.85	0.89	0.90	0.87	0.67	-
Mean	2.92	2.85	2.92	3.00	3.53	3.04
SD	0.95	0.97	0.97	0.94	0.77	0.77

Table 7

Fit indices for measurement invariance tests on the stigma and social distance scale

Model	N	χ^2 (p)	df	CFI	CFI	RMSEA	RMSEA
Personal stigma							
Drug rehabilitation center							
Voluntary	603	9.466(0.304)	8	0.998	-	0.017	-
Compulsory	181	17.737(0.023)	8	0.950	-	0.082	-
Configural invariance	784	27.203(0.039)	16	0.988	-	0.042	-
Metric invariance	784	30.666(0.060)	20	0.989	−0.001	0.037	0.005
Scalar invariance	784	35.070(0.067)	24	0.988	0.001	0.034	0.003
Perceived stigma							
Drug rehabilitation center							
Voluntary	603	23.231(0.003)	8	0.991	-	0.056	-
Compulsory	181	22.865(0.004)	8	0.960	-	0.101	-
Configural invariance	784	46.096(<0.001)	16	0.986	-	0.069	-
Metric invariance	784	51.301(<0.001)	20	0.985	0.001	0.063	0.006
Scalar invariance	784	65.337(<0.001)	24	0.981	0.004	0.066	−0.003
Social distance							
Drug rehabilitation center							
Voluntary	603	31.023(<0.001)	5	0.987	-	0.093	-
Compulsory	181	15.650(<0.008)	5	0.977	-	0.108	-
Configural invariance	784	46.673(<0.001)	10	0.985	-	0.097	-
Metric invariance	784	48.733(<0.001)	14	0.985	0.000	0.080	0.017
Scalar invariance	784	59.268(<0.001)	18	0.983	0.002	0.076	0.004