ORIGINAL ARTICLE

The mediating role of perceived social support in the relationship between perceived stigma and depression among individuals diagnosed with substance use disorders

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Abstract

Introduction: Although the relationship between perceived stigma and mental health outcomes are documented in the existing literature, very few studies have investigated the mechanism linking perceived stigma and mental health outcomes among individuals diagnosed with substance use disorders. To the best of the present authors' knowledge, the social support deterioration deterrence model has never been tested in the context of perceived stigma among individuals diagnosed with substance use disorders.

Aim/Question: Guided by the social support deterioration deterrence model, the present study investigated the mediating role of perceived support from three types of social network members (i.e., significant others, family members, friends) in the association between perceived stigma and depression in individuals diagnosed with substance use disorders.

Method: The study employed a cross-sectional survey design comprising 300 participants diagnosed with substance use disorders in Taiwan.

Results: Results of a structural equation modeling analysis indicated that perceived stigma was significantly associated with depression. The relationship between perceived stigma and depression was partially mediated by perceived family support and perceived friend support.

Discussion: Consistent with the prediction of the social support deterioration deterrence model, the negative effect of perceived stigma on depression for individuals diagnosed with substance use disorders is through the mediating effect of social support.

Implications for practices: Based on the present study's results, psychosocial interventions to increase perceived support from family and friends would be helpful in addressing negative effects of perceived stigma on mental health among individuals diagnosed with substance use disorders.

Keywords: depression; stress; social support; stigma; substance use

Relevance Statement
Mental health nursing needs information to design effective program to assist individuals diagnosed with substance use disorders to overcome their mental health problems The present study results indicate a potential mechanism to describe the factors relevant to depression among individuals diagnosed with substance use disorders. More specifically, high perceived stigma is associated with low perceived support from family and friends. In turn, low perceived support from family and friends is associated with high levels of depression among individuals diagnosed with substance use disorders. Mental health professionals may therefore design programs that could enhance perceived social support and decrease perceived stigma for individuals diagnosed with substance use disorders to improve their mental health.

Accessible Summary
What is known on the subject
- Individuals diagnosed with substance use disorders may perceive stigma and suffer from mental health problems.
- Perceived stigma is related to poor mental health among individuals diagnosed with substance use disorders.
- Social support deterioration deterrence model proposes that stressors (e.g., perceived stigma) negatively affect mental health via reduced perceived social support. To the best of the present authors' knowledge, the model has never been tested in the context of perceived stigma among individuals diagnosed with substance use disorders.

What the paper adds to existing knowledge
- The paper used structural equation modeling to reveal that social support deterioration deterrence model could explain the relationship between perceived stigma and depression among individuals diagnosed with substance use disorders.
- Perceived support from family and friends are mediators in the association between perceived stigma and depression among individuals diagnosed with substance use disorders.

What are the implications for practice
- Psychosocial interventions to increase perceived support from family and friends would be helpful in addressing perceived stigma effects on mental health.

Introduction

Stigmatization occurs when an individual possesses an identity that is devalued by the society in which they live (Croker et al., 1998). Research has demonstrated that the general public has more negative attitudes towards substance use compared to mental illness (Barry et al., 2014; Clement et al., 2015; Room, 2005). Stigma has been recognized as a stressor for individuals diagnosed with substance use disorders (Birtel et al., 2017; Schomerus et al., 2011). Stigma towards substance users is one factor that could hinder help-seeking and utilization of treatment services (Keyes et al., 2010; Luoma et al., 2007; Tuliao & Holyoak, 2020). Due to the apprehension of rejection or insult, stigma perceived by individuals diagnosed with substance use disorders could result in increased social withdrawal from their social support networks (van Boekel et al., 2016). Furthermore, because discrimination towards individuals diagnosed with substance use disorders is prevalent in most societies, stigma could inhibit the stigmatized individual from pursuing personal goals, resulting in reduced opportunities of education and employment (Barry et al., 2014; van Boekel et al., 2016). Studies have shown that higher perceived stigma is related to low self-esteem, poor quality of life, depression and anxiety among substance users (Birtel et al., 2017; Luoma et al., 2010; Singh et al., 2018).

Although stigma could lead to discrimination and devaluation towards the stigmatized group, its effects partially depend on individuals' perceptions of stigma-related harm (Crapanzano et al., 2018; Major & O'Brien, 2005). Individuals who perceive stigma towards their belonging to stigmatized groups often anticipate and are afraid of discrimination and devaluation associated with their stigmatized attributes (Corrigan & Watson, 2002). Therefore, perceived stigma could be considered as a pervasive stressor in the daily lives of stigmatized individuals. A recent study reported that high levels of perceived stigma predicted high stress appraisal among individuals with various psychiatric disorders (Rüsch et al., 2018).

Despite that the relationship between perceived stigma by individuals diagnosed with substance use disorders and poor mental health outcomes has been documented in literature (Birtel et al., 2017; Luoma et al., 2010), knowledge on mechanisms underlying this association is still very limited. A better understanding of the mechanisms is imperative to help mental health and substance use treatment service providers develop interventions to address the negative impacts of perceived stigma.

Social support deterioration deterrence model

The *social support deterioration deterrence model* (SSDDM) (Kaniasty & Norris, 1993; Norris & Kaniasty1996) might help practitioners and researchers understand how perceived stigma links to mental health outcomes among individuals diagnosed with substance use disorders. The SSDDM is a theoretical model that attempts to explain the relationship between stressor, social support, and mental health. It posits that stressors have direct effects and indirect effects, through the effects of reduced perceived social support, on mental health (Norris & Kaniasty,1996; Prati & Pietrantoni, 2010). Social support has been identified as an important factor for promoting good mental health in stressful situations (Thoits, 2011). Support from social support network members could help an individual address stress-related issues and enhance feelings of hope and self-efficacy (DeLongis & Holtzman, 2005). Moreover, social support can reduce the sense of loneliness and enhance self-esteem during a stressful time (Wang et al, 2018). When comparing received social support and perceived social support, perceived support has been shown to be a stronger factor in good mental health (Thoits, 2011).

In the SSDDM, the role of social support in good mental health is acknowledged in stress coping. The model also hypothesizes that stressful situations/stressors could decrease levels of perceived social support and, in turn, this could lead to poor mental health (Norris & Kaniasty, 1996; Chen & Wei, 2013). Perceived social support refers to the belief that such helping

behaviors are available when needed (Ioannou et al., 2018). Several reasons can be posited to account for reduced perceived social support in stressful situations. For example, because the demand for support in stressful situations can exceed the amount of support provision available, dissatisfaction could result in diminished perceptions of available social support (Norris & Kaniasty, 1996). Moreover, because stressors can affect social relationships in a negative way, stress could lead to a reduction in social support provision. In chronic situations, perceived social support can be eroded because chronic stressor can deplete limited resources and cause burnout on the side of social network members, resulting in reduced provision of social support (Kaniasty & Norris, 1993; Prati & Pietrantoni, 2010). With low perceived social support, a stressed individual tends to have poorer mental health (Chen 2020; Kaniasty & Norris, 1993; Norris & Kaniasty1996).

The SSDDM has been tested in the context of disaster, trauma, victimization, and economic stress (Chen & Hung, 2020; Chen & Wei, 2013; Gjesfjeld et al., 2010; Kaniasty & Norris, 1993; Lowe et al., 2010; Prati & Pietrantoni, 2010; Punamäki et al., 2005). However, to the best of the present authors' knowledge, the model has never been tested in the context of perceived stigma among individuals diagnosed with substance use disorders.

The present study

Guided by the SSDDM, the present study investigated the mediating role of perceived support in the association between perceived stigma and depression among individuals diagnosed with substance use disorders. Because support from various sources could impact mental health in different ways (Alsubaie et al., 2019; Bélanger et al., 2016; Chen, 2020; Li et al., 2014; Zunzunegui et al., 2001), the mediating effect of three types of perceived support, including perceived family support, perceived friend support, and perceived significant others' support, were investigated separately. Although the effects of different types of perceived support were investigated separately, all the types of support were simultaneously included in the same structural equation modeling (SEM) model. It is envisaged that the findings will provide insight on the mechanism linking perceived stigma and depression among individuals diagnosed with substance use disorders. Three hypotheses (H_s) were developed for the present study:

- H_1: The relationship between high perceived stigma and depression would be mediated via low perceived significant others' support.
- H_2: The relationship between high perceived stigma and depression would be mediated via low perceived family support.
- H_3: The relationship between high perceived stigma and depression would be mediated via low perceived friend support.

Methods
Participants and procedure

Individuals with a diagnosis of substance use disorders (including opioid, amphetamine, or alcohol use) verified by the DSM-5 diagnostic criteria (American Psychiatric Association, 2013) were the target population. With the assistance of staff from one general hospital and one psychiatric center (both located in Tainan, Taiwan), a total of 300 patients were invited and participated in the study (with the study period being between January 2019 and April 2020). The sample size of 300 was determined utilizing the primary statistical method used in the present study (i.e., structural equation modeling, please see 'Data analysis' section for detailed information). It has been recommended that the adequate size for structural equation modeling estimation is 300 participants (Comrey & Lee; 2013; Tabachnick & Fidell; 2013).

Apart from the diagnosis of substance use disorders, other inclusion criteria included (i)

being aged above 20 years; and (ii) having sufficient cognition to understand the questions and psychometric scales used in the study (sufficient cognition was verified by research assistants through conversation). Exclusion criteria included those (i) having intellectual disabilities; and (ii) having dementia. First, several psychiatrists screened the potential participants and referred them to the research assistants to introduce the study purpose. Second, after understanding the study purpose, all the participants were willing to participate and gave their written informed consent. More specifically, all the referred participants were willing to participate in the study. Third, all the participants completed a self-report survey including various psychometric scales (described below) and basic demographic information (e.g., age and gender). Moreover, co-occurring medical conditions and psychiatric disorders were assessed using the medical records with permission provided by the participants. The study protocol was approved by the Institutional of Review Boards in the BLANK FOR BLINDED REVIEW (Ref no. 10709-007) and the BLANK FOR BLINDED REVIEW (Ref no. 18-039). That is, both institutions provided ethical approvals for the present study.

Measures
Perceived Stigma toward Substance Users Taiwan Version (PSAS-TV)
The present study used the nine-item PSAS-TV to assess how individuals diagnosed with substance use disorders perceived stigma. Using a rating scale from 1 (*strongly disagree*) to 4 (*strongly agree*) with negatively worded items reverse-coded, a higher PSAS-TV score indicates that the participants perceive a higher level of perceived stigma. The original PSAS English version was found to have good psychometric properties (Luoma et al., 2010). The present study used the local language in the PSAS-TV (i.e., traditional Chinese), which has demonstrated satisfactory psychometric properties (C.-C. Chang et al., 2020). Moreover, the PSAS-TV used in the present study had good internal consistency ($\alpha = 0.82$).

Taiwan Depression Questionnaire (TDQ)
The present study used the 18-item TDQ to assess depression among individuals diagnosed with substance use disorders. Using the rating scale from 0 (no or seldom; less than one day per week) to 3 (*usually or always; five to seven days per week*), a higher TDQ score indicates that the participants have a higher level of depression. The present study used the local language in the TDQ (i.e., traditional Chinese), which has demonstrated satisfactory psychometric properties (Lee et al., 2000, 2016). Moreover, the TDQ used in the present study had excellent internal consistency ($\alpha = 0.96$).

Chinese Multidimensional Scale of Perceived Social Support (CMSPSS)
The present study used the 12-item CMSPSS to assess how individuals diagnosed with substance use disorders perceived social support from different sources (significant others, family, or friends). Each subscale of the CMSPSS (i.e., subscales of significant others, family, and friends) contains four items. Using the rating scale from 1 (*strongly disagree*) to 7 (*strongly agree*), a higher CMSPSS score indicates that the participants perceive a higher level of support from each source (significant others, family, or friends). The present study used the local language in the CMSPSS (i.e., traditional Chinese), which has demonstrated satisfactory psychometric properties (Chou, 2000; Zhang & Norvilitis, 2002). Moreover, the CMSPSS used in the present study had very good internal consistency ($\alpha = 0.83$ for significant others subscale; 0.86 for family subscale; and 0.85 for friends subscale).

Data analysis
First, the participants' characteristics (including clinical characteristics, demographics, and questionnaire scores) were analyzed using descriptive statistics. In the descriptive statistics, continuous variables were presented using means and SDs; categorical variables were

presented using frequency and percentage. Second, Pearson correlations were applied to understand the associations between the studied variables (including age, gender, educational year, depression, perceived stigma, perceived support from others, perceived support from family, and perceived support from friends).

Third, SEM with a maximum likelihood estimator was performed to examine the perceived stigma buffering model proposed (Figure 1). Depression (dependent variable), perceived stigma (independent variable), and different sources of perceived support (mediators) were constructed as latent variables using their corresponding scale items. Age, gender, and educational year were entered in the SEM model as controlled variables. The proposed model was first examined using fit indices to determine whether it is supported or not. The cutoffs used for the fit indices included nonsignificant χ^2 test, comparative fit index (CFI) > 0.9, Tucker-Lewis index (TLI) > 0.9, root mean square error of approximation (RMSEA) <0.08, and standardized root mean square residual (SRMR) <0.08 (Chang et al., 2020; Lin et al., 2019; Yam et al., 2019). However, the χ^2 test is sensitive to large sample size and was not used to determine the model fit if other fit indices were satisfactory (Wu et al., 2015). After ensuring the good fit of the proposed model, the path coefficients in the model were evaluated and the indirect effects from perceived stigma to depression were examined. The significances of the indirect effects were determined using Sobel test (Sobel, 1982). The statistical analyses were performed using SPSS 24.0 (IBM Corp., Armonk, NY) and the lavaan package (Rosseel, 2012) in the R 3.5.1 software.

Results

Table 1 shows that the participants (n=300) were middle aged (mean age = 45.22 years; SD±9.99 years) with the majority being male (n=255; 85.0%). Nearly one-quarter of the participants were currently married (n=72; 24.0%); approximately half of the participants had one or more medical conditions (n=155; 51.7%); and slightly over one-third of the participants had one or more co-occurring psychiatric disorders (n=106; 35.3%). Additional characteristics are shown in Table 1.

(Insert Table 1 here)

Table 2 shows the correlations between studied variables. Depression was positively and significantly associated perceived stigma (r = 0.30; p<0.001), and negatively and significantly associated with different sources of perceived support (r = -0.33 to -0.17; all p-values <0.01). Perceived stigma was negatively and significantly associated with different sources of perceived support (r = -0.30 to -0.15; all p-values<0.05). Moreover, different sources of perceived support were found to be positively correlated with each other (r = 0.48 to 0.56; all p-values<0.001).

(Insert Table 2 here)

Fit indices of the proposed model were satisfactory (CFI=0.92, TLI=0.91, RMSEA=0.05, and SRMR=0.05) and the factor loadings of the items embedded in corresponding latent variables were high (loadings = 0.57 to 0.84 for depression; 0.41 to 0.74 for perceived stigma; and 0.63 to 0.88 for perceived support) (Table 3).

H_1 was rejected as demonstrated in Figure 2. More specifically, the path coefficients showed that perceived stigma was significantly associated with perceived support from significant others (standardized coefficient [β] = -0.17; p=0.01; coefficient [SE] = -0.30 [0.12]). However, perceived support from significant others was not significantly associated with depression (β = 0.09; p=0.26; coefficient [SE] = 0.06 [0.05]). The indirect effect of perceived support from significant others was not significant in the association between perceived stigma and depression either (β = -0.02; p=0.31; coefficient [SE] = -0.02 [0.02]).

H_2 was accepted as demonstrated in Figure 2. As indicated in the results, perceived stigma

was significantly associated with perceived support from family (β = -0.40; $p<0.001$; coefficient [SE] = -0.82 [0.16]). Perceived support from family was significantly associated with depression (β = -0.19; $p=0.03$; coefficient [SE] = -0.10 [0.05]). Moreover, indirect effects of perceived support from family was significant in the association between perceived stigma and depression (β = 0.07; $p=0.04$; coefficient [SE] = 0.08 [0.04]).

H$_3$ was accepted as demonstrated in Figure 2. The results indicated that perceived sigma was significantly associated with perceived support from friends (β = -0.19; $p=0.01$; coefficient [SE] = -0.48 [0.18]). Perceived support from friends was associated with depression (β = -0.22; $p=0.001$; coefficient [SE] = -0.10 [0.03]). Additionally, findings also showed that the indirect effect of support from friends was significant in the association between perceived stigma and depression (β = 0.04; $p=0.03$; coefficient [SE] = 0.05 [0.02]).

(Insert Table 3 and Figure 2 here)

Discussion

The present study investigated the direct effect of perceived stigma on depression and the mediating effects of perceived social support in the association between perceived stigma and depression among individuals with substance use disorders. The results indicated that high perceived stigma was associated with high perceived support from significant others' support, high perceived family support, high perceived friend support and depression. High perceived family support and high perceived friend support were associated with depression. In addition, the relationship between high perceived stigma and depression was mediated via perceived family support and perceived friend support.

The SSDDM asserts that stressor (i.e., the perceived stigma in the present study) may inhibit the protective effects of perceived support on an individual's mental health (i.e., the depression in the present study) (Norris, & Kaniasty, 1996; Chen & Wei, 2013). The present finding of negative associations between perceived stigma and perceived social support corroborates this assertion. This finding is in line with the findings of a previous study examining the association between perceived stigma and perceived social support in individuals diagnosed with substance use disorders (Birtel et al., 2017). However, while the previous study revealed the relationship of perceived stigma with overall perceived social support (Birtel et al., 2017), findings of the present study advance our knowledge in this area by showing that perceived stigma are related to three specific types of perceived social support (i.e., perceived significant other support, perceived, family support, perceived friend support).

While previous study findings suggest that perceived support is a protective factor inhibiting the development of mental health problems (Chen & Hung, 2020; Chen & Wei, 2013; Gjesfjeld et al., 2010; Kaniasty & Norris, 1993; Lowe et al., 2010; Prati & Pietrantoni, 2010; Punamäki et al., 2005), the present study finding partially supports those of previous studies. More specifically, perceived support from significant others was not a significant factor associated with depression among individuals diagnosed with substance use disorders in the present study. In Taiwan's culture, the term 'significant others' is usually understood as 'important individuals', and Taiwanese individuals usually think about their family, friends, and the individuals they are intimate with. Therefore, some of 'significant others' identified by the participants in the present study were either their family members or friends.

Indeed, the aforementioned terminology is supported by the present study's findings of moderate and significant associations between perceived significant others' support and perceived family support (r = 0.56, p-values <0.05), and between perceived significant others' support and perceived friend support (r = 0.53, p-values <0.05). In such a case, the effect of significant others' support on depression levels could become statistically non-significant,

controlling for perceived family and friend supports. To clarify the role of perceived significant others' support in mental health promotion in individuals diagnosed with substance use disorders, future studies to identify the relationship to significant others and perceived support from them would be needed. Nevertheless, given that social support from various sources could impact mental health outcomes in different ways (Alsubaie et al., 2019; Bélanger et al., 2016; Chen, 2020; Li et al., 2014; Zunzunegui et al., 2001), the findings of the present study highlight the important role of perceived family support and perceived friends support in decreasing depression among individuals diagnosed with substance use disorders.

The present findings also indicated that perceived support from family (β = 0.07; p=0.04; coefficient [SE] = 0.08 [0.04]) was a stronger mediator than perceived support from friends in the association between perceived stigma and depression(β = 0.04; p=0.03; coefficient [SE] = 0.05 [0.02]), because the strength of the relationship between perceived stigma and perceived support from family (β = -0.40; p<0.001; coefficient [SE] = -0.82 [0.16]) was twice greater than the strength of the relationship between perceived stigma and perceived support from friends (β = -0.19; p=0.01; coefficient [SE] = -0.48 [0.18]). In Chinese societies, such as Taiwan, family members are expected to be the major source of support for individuals (Hämäläinen et al., 2019). Consequently, the demand for family support from family members is larger than the demand for friend support in facing stigma-related stress. When the demand for support exceeds the available amount of support due to perceived stigma-related stress, the dissatisfaction could result in diminished perceptions of social support (Norris & Kaniasty, 1996). It is possible that the high expected availability of support from family in Taiwanese society and the discrepancy between the expected and actual availability of support from family might explain why the relationship between perceived stigma and perceived family support was much stronger than the relationship between perceived stigma and perceived friend support.

What the study adds to the existing evidence

While the relationship between perceived stigma and depression among individuals diagnosed with substance use disorders has been documented in existing literature, the mechanism underlying this relationship has been understudied (Birtel et al., 2017; Luoma et al., 2010). To the best of present authors' knowledge, the mediating role of perceived support in the relationship between perceived stigma and depression has not been investigated in previous studies. The findings of present study add to the existing evidence by demonstrating that, among individuals diagnosed with substance use disorders, the relationship between high perceived stigma and depression was mediated via perceived social support, particularly perceived family support and perceived friend support.

Implications

Over the past decade, efforts to mitigate stigma effects on health and mental health among individuals diagnosed with substance use disorders tend to focus on reducing public stigma and structural stigma (e.g., Livingston et al., 2012; Nyblade et al., 2019). The study findings, which suggested the mediating role of perceived family support and perceived friend support in the relationship between perceived stigma and depression, provide a new insight in mitigating stigma effects on mental health in individuals with substance use disorders. More specifically, psychosocial interventions to enhance levels of perceived support from family members and friends could be helpful in mitigating the negative effects of perceived stigma on mental health. Given the findings that perceived stigma is associated with support from family and friends, service providers could also discuss with individuals diagnosed with substance use disorders about how perceived stigma can affect their perceptions of social support, and help them identify support that could combat the negative effects of perceived stigma. In addition, because the findings suggest that perceived stigma is related to depression, clinicians should also make efforts to decrease perceived stigma in individuals diagnosed with substance use

disorders.

Limitations

There are several limitations in the present study. First, the present study adopted a cross-sectional design. Therefore, the causal relationships cannot be determined. Evidence using a robust longitudinal design in testing temporal associations among the three factors (i.e., perceived stigma, perceived support, and depression) is needed to verify the causality among perceived stigma, perceived support, and depression. Second, the participants were recruited from one area in Taiwan and therefore the representativeness of the present sample is restricted. Future national studies are needed to corroborate the present study's findings in other ethnic and cultural groups. Third, all the data collected in the present study were self-report. Therefore, common biases from this type of methodology cannot be eliminated. For example, the participants may not have wanted to disclose that they had depression issues and answered the questions in the survey in a socially desirable way. However, given the robust psychometric properties in the scales used in the present study, such biases might not be of serious concern.

Conclusions

The present study empirically supported the SSDDM by demonstrating that perceived stigma was directly and indirectly (via the effect of reduced perceived family and friend support) associated with depression among individuals diagnosed with substance use disorders. The findings suggest a psychosocial approach is needed to mitigate negative effect of stigma. Future interventions aimed to address the stigma effect should focus on increasing perceived family and friend support. Such interventions may be more effective when combined with strategies to change misperception on social support availability.

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Table 1. Participant characteristics (N=300)

	Mean (SD)	Range	n (%)	Skewness	Kurtosis
Age (years)	45.22 (9.99)	22-74		0.04	-0.06
Sex (male)			255 (85.0)		
Marital status (currently married)			72 (24.0)		
Educational year	10.41 (2.84)	2-22		0.37	0.75
Medical condition[a]			155 (51.7)		
Co-occurring psychiatric disorder[b]			106 (35.3)		
Heroin use			110 (36.7)		
Onset age of heroin use (year)	26.68 (7.01)	14-50		0.69	0.62
Amphetamine use			145 (48.3)		
Onset age of amphetamine use (year)	27.23 (10.10)	12-56		0.83	0.29
Alcohol use			145 (48.3)		
Onset age of alcohol use (year)	21.10 (7.29)	12-53		1.88	4.24
Perceived stigma[c]	2.63 (0.43)	1.1-4.0		0.50	1.41
Depression[d]	12.58 (13.01)	0-53		1.29	0.94
Perceived support from others[e]	4.75 (1.08)	1-7		-0.38	0.04
Perceived support from family[f]	4.37 (1.21)	1-7		-0.45	0.26
Perceived support from friends[g]	4.78 (1.19)	1-7		-0.59	0.39

[a] Including HIV infection, hepatitis B virus infection, hepatitis C virus infection, hypertension, diabetes mellitus, endocarditis, stroke, cirrhosis, upper gastrointestinal bleeding, pancreatitis, or cellulitis. [b] Including schizophrenia, unspecified psychosis, anxiety disorder, depression disorder, bipolar disorder, or insomnia. [c] Perceived stigma was assessed using the Perceived Stigma toward Substance Users Scale Taiwan version, with nine items; presented using average score of nine items. [d] Depression was assessed using the Taiwan Depression Questionnaire, with 18 items; presented using total score of 18 items. [e] Perceived support from others was assessed using the Chinese Multidimensional Scale of Perceived Social Support Significant Other subscale, with four items; presented using average score of four items. [f] Perceived support from family was assessed using the Chinese Multidimensional Scale of Perceived Social Support Family subscale, with 4 items; presented using average score of four items. [g] Perceived support from friends was assessed using the Chinese Multidimensional Scale of Perceived Social Support Friends subscale, with four items; presented using average score of four items.

Table 2. Correlation matrix among studied variables

	1.	2.	3.	4.	5.
			r (p-value)		
1. Age	--				
2. Gender	-0.16**	--			
3. Educational year	-0.31***	-0.07	--		
4. Depression	-0.05	0.29 ***	0.08	--	
5. Perceived stigma	0.10	0.02	0.03	0.30 ***	--
6. Perceived support from others	-0.03	0.01	0.05	-0.17**	-0.15*
7. Perceived support from family	-0.07	-0.01	0.02	-0.29***	-0.30***
8. Perceived support from friends	-0.08	-0.07	0.03	-0.33***	-0.19**

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

Depression was assessed using the Taiwan Depression Questionnaire, with 18 items.

Perceived stigma was assessed using the Perceived Stigma toward Substance Users Scale Taiwan version, with nine items.

Perceived support from others was assessed using the Chinese Multidimensional Scale of Perceived Social Support Significant Other subscale, with four items.

Perceived support from family was assessed using the Chinese Multidimensional Scale of Perceived Social Support Family subscale, with four items.

Perceived support from friends was assessed using the Chinese Multidimensional Scale of Perceived Social Support Friends subscale, with four items.

Table 3. Factor loadings of constructs in the perceived stigma buffering model

| Construct Item #	Factor loading	Construct Item #	Factor loading
Depression		**Perceived stigma**	
D1	0.64	P1	0.66
D2	0.77	P2	0.74
D3	0.57	P3	0.55
D4	0.59	P4	0.48
D5	0.68	P5	0.41
D6	0.69	P6	0.65
D7	0.80	P7	0.41
D8	0.74	P8	0.67
D9	0.79	P9	0.41
D10	0.71	**Perceived support from others**	
D11	0.80	PO1	0.63
D12	0.76	PO2	0.88
D13	0.80	PO3	0.74
D14	0.84	PO4	0.88
D15	0.76	**Perceived support from family**	
D16	0.84	PFa1	0.67
D17	0.78	PFa2	0.74
D18	0.81	PFa3	0.88
		PFa4	0.79
		Perceived support from friends	
		PFr1	0.88
		PFr2	0.84
		PFr3	0.79
		PFr4	0.66
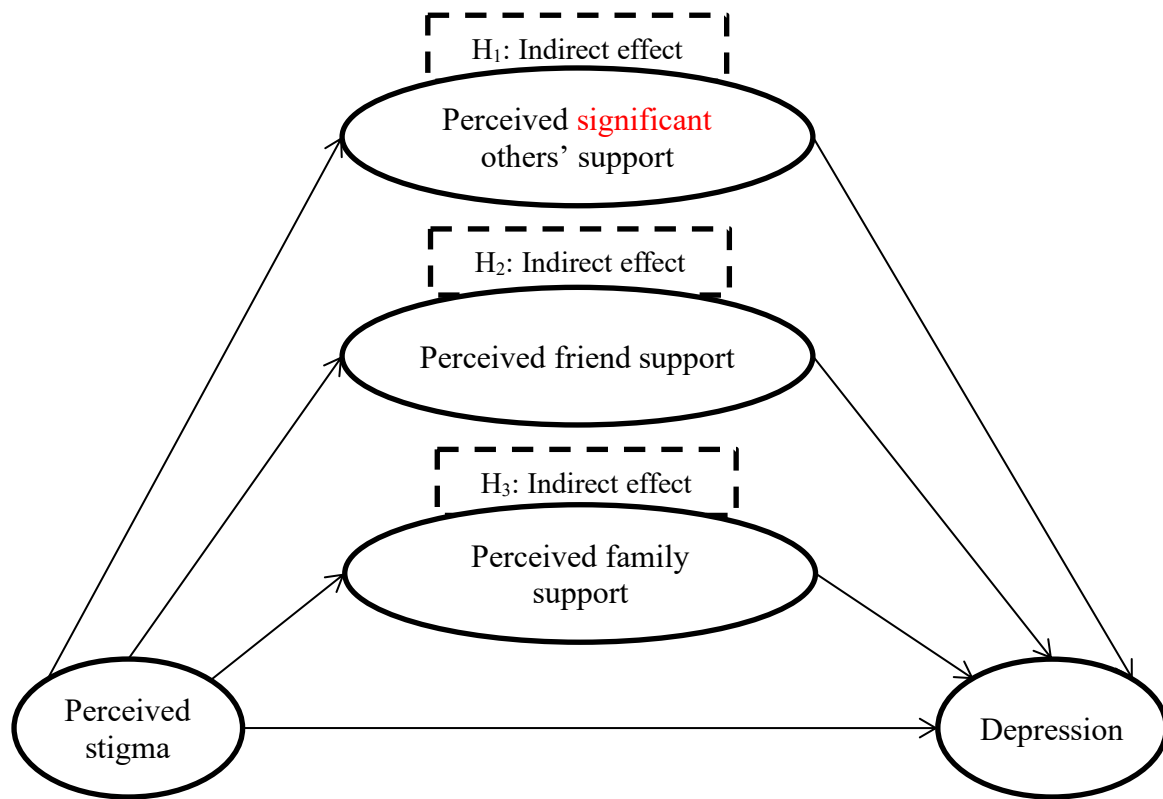
Figure 1. Perceived stigma mediation model
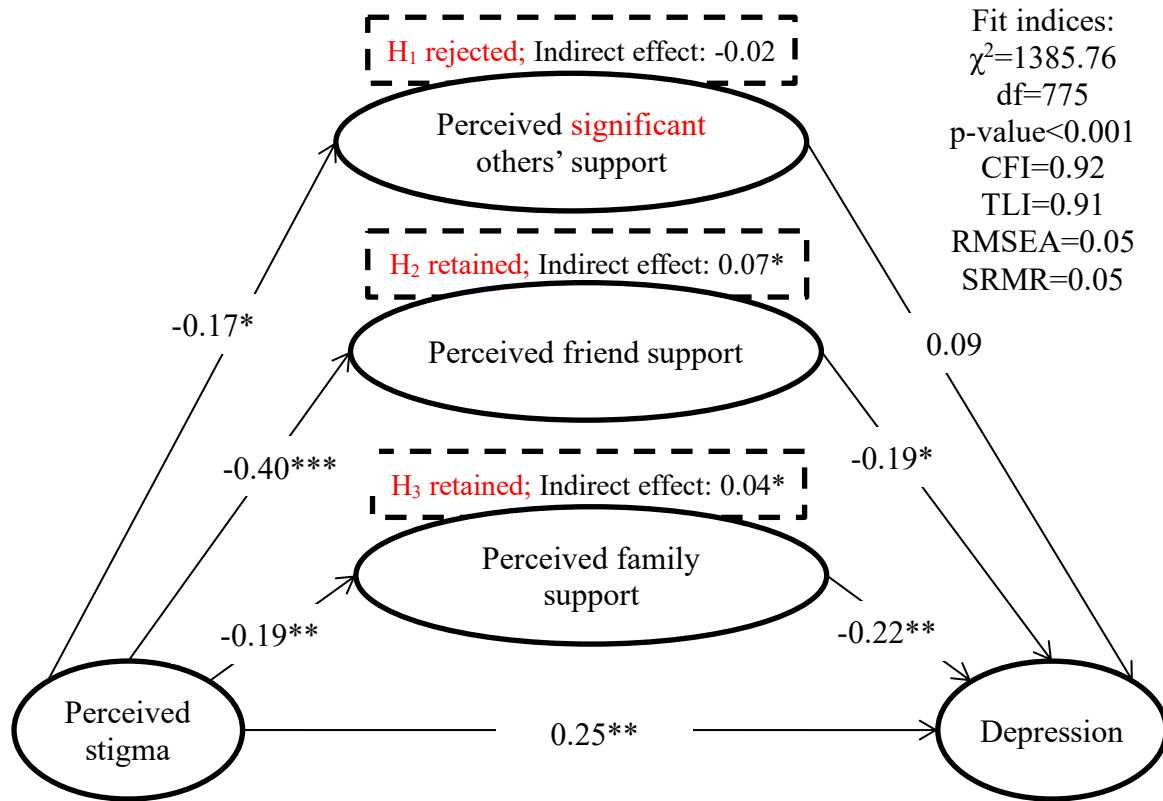
Figure 2. Standardized results of the perceived stigma mediating model. Age, gender, and educational year were controlled in the model.

CFI=comparative fit index; TLI=Tucker-Lewis index; RMSEA=root mean square error of approximation; SRMR=standardized root mean square residual.

*p<0.05; **p<0.01; ***p<0.001