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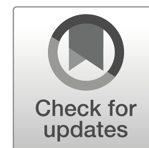

How is perceived social support linked to life satisfaction for individuals with substance-use disorders? The mediating role of resilience and positive affect

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Abstract
This study was designed to analyze how perceived social support is correlated with life satisfaction through mediators of resilience and positive affect. A total of 397 Chinese individuals with substance-use disorders were asked to complete the Multidimensional Scale of Perceived Social Support (MSPSS), the Connor-Davidson Resilience Scale (CD-RISC), Positive and Negative Affect Schedule (PANAS), and the Satisfaction with Life Scale (SWLS). Structural Equation-Modeling (SEM) results indicated that resilience fully mediated the relationship between perceived social support and life satisfaction and also revealed that the paths from social support through resilience and positive affect to life satisfaction were significant, although positive affect was not found to mediate the link between social support and life satisfaction. Finally, a multiple group analysis indicated that females with high resilience scores were more likely to exhibit greater positive affect than males. This study offers a practical application for health professionals seeking to implement effective interventions and improve the well-being of individuals with substance-use disorders.

Keywords Social support · Life satisfaction · Resilience · Positive affect · Individuals with substance use disorders

Introduction

Drug dependence is one of the most significant hazards to public health that has received widespread attention, and over the past 10 years the incidence of morbidity and mortality caused by drug abuse has been growing rapidly (Johnson 2013). Compared to those not using drugs, people with substance use disorder (SUD) are more likely to suffer a wider range of problems. Ample evidence has revealed that SUD is associated with psychological and physiological issues such as social angst, depression, impulsivity, schizophrenia, and other mental disorders (OrtízGómez et al. 2014; Park et al. 2015).

While it is widely known that people with SUD are at high risk of suffering long periods of negative experience, this study focused on those who have achieved positive outcomes and increased life satisfaction despite experiencing adverse living conditions. Life satisfaction, referring to an individual's complex feelings of happiness and overall sense-of-life situation (Diener et al. 1985), is an important predictor of many factors, including interpersonal and intrapersonal outcomes (Proctor et al. 2009). It is composed of many resources such as autonomy, faith, sentiments, and dispute-settling (Ambriz et al. 2012). Individuals with SUD might suffer from other social issues like loss of identification, financial difficulties, and insufficiency of social support (Calcaterra et al. 2014), and after they return to society, societal pressure often forces them to relapse (Chie et al. 2015). A birth cohort study of 1265 children from 18 to 35 years conducted in New Zealand suggests that while illicit substance dependence was proven to pose significant threats to substance users' life satisfaction (Fergusson et al. 2015), protective factors can mitigate the

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harmful effects. Social support is one of the effective protective factors regarding buffering adverse impacts caused by substance-rated issues (Laudet et al. 2004; Moos 2007; Warren et al. 2007). Previous research provides strong empirical support of the proposition that people with low levels of social support are more likely to increase mental health and cognitive health risks related to marijuana use (Choi et al. 2016). While perceived social support is positively associated with life satisfaction in people with SUD (Cao and Zhou 2019), resilience and positive affect also have protective effects for those with substance abuse experience (Liu et al. 2013b; Yang et al. 2018). It has been proven that substance users with high resilience experience higher levels of life satisfaction than those with low resilience (Yang et al. 2018). Blanchard et al. (1999) also found that positive affect was positively related to coping with negative outcomes from substance use, a result consistent with an affect regulation model of substance use. People with high affect balance were also more likely to experience higher life satisfaction than those with low affect balance (Liu et al. 2013b). In addition, robust studies have revealed positive associations between perceived social support and resilience and positive affect (Horton and Wallander 2001; Wesley et al. 2013). Social support can offer a buffering effect, a crucial factor of resilience (Bitsika et al. 2013; Catalano et al. 2011) and positive affect (Kong et al. 2019). There is therefore a rationale to involve resilience and positive affect into examination of the relationship between perceived social support and life satisfaction.

Some studies have found that social support may impact life satisfaction through mediators such as self-esteem (Stroebe et al. 1996), loneliness (Tian 2016), self-control (Tu and Yang 2016), and core self-evaluation (Jiang et al. 2017), which helps us understand associations among these factors. Based on previous literature, social support, resilience and positive affect are also significantly protective factors that can mitigate the harmful effects of substance-users' life satisfaction. While life satisfaction, social support, resilience, and positive affect among individuals with SUD have been separately studied, to our knowledge there have been no studies focused on life satisfaction as an outcome in individuals with SUD that consider the simultaneous effects of social support, resilience, and positive affect. We therefore attempted to explore how these constructs relate to one another, with specific focus on the mediating roles of resilience and positive affect on the association between perceived social support and life satisfaction. This may provide useful and valuable information for substance abuse treatment and rehabilitation projects designed for facilitating life satisfaction of people with SUD.

Social Support and Life Satisfaction

Social support refers to support provided by communities, social networks, and close partners, including perceived, practical instrumental, and expressive support (Lin 1986). Social support acts as a potential resource for people coping with psychological tension, protecting them from stressful and oppressive events, improving their social adaptability, and making them more resilient to unfavorable environments (Cutrona et al. 1986). Social support is comprised of both received and perceived social support (Oh et al. 2014). Received social support refers to practical support provided by others near to individuals, while perceived social support is the subjective perception and evaluation of family, friends, and other supporting entities (Koydemir et al. 2013). In epidemiological studies, perceived and received social support are not interchangeable, and significant distinctions have been made between them (Uchino et al. 2011). First, a number of studies show that perceived social support is more effective at predicting an individual's mental health than received social support (Cohen and Syme 1985; Wethington and Kessleer 1986). Second, although life satisfaction is related to both types of social support, research has shown that perceived social support is more associated with improved life satisfaction (Young 2006). Perceived social support indicates how much help is available and accessible when it is needed to improve a recipient's coping resources and skills (Wethington and Kessler 1986), in turn increasing life satisfaction (Cao and Zhou 2019). Conversely, receiving social support from others may spotlight the needs of recipients and thereby threaten their self-esteem (Uehara 1995), possibly reducing their life satisfaction (Moksnes and Espnes 2013). Third, use of methodological approaches may lead to significant differences between the impact of perceived social support and received social support on health outcomes (Howard et al. 2017). Research has proven that perceived social support tends to focus on survey methods, while received social support more frequently uses laboratory-based design of experiments (e.g., Kamarck et al. 1990). Combining these results from the literature, this study adopted perceived social support rather than received social support as an independent variable, examining how perceived social support exerts an effect on life satisfaction in individuals with SUD through self-reporting questionnaires.

Based on social control theory (Hirschi 1969), close ties with family, friends, and other social bonds encourage individuals to engage in responsible and acceptable goals and pursuits, and this is helpful for preventing substance abuse and other abnormal behaviors (Moos 2007). Lower perceived social support has been significantly associated with individuals with marijuana use disorder (Choi et al. 2016), and as the social identity model of recovery (Best et al. 2016) has shown, increased social connections and changes in social networks are conducive to a successful transition from addiction to rehabilitation (Atadokht et al. 2015). Dodge and Potocky (2000) found that perceived social support can inhibit drug relapse by increasing

psychological health, revealing that social support is a key protective factor for substance users.

According to the buffering model, in situations where people face high-level life stressors, perceived social support can fully or partially protect individuals being affected by stressful events and thereby promote their health (Cohen and Wills 1985). Numerous studies have affirmed social support as a predictor of life satisfaction (Kong et al. 2013; Oh et al. 2014). The literature reveals that high perceived social support is closely related to greater life satisfaction (Davey et al. 2014; Helgeson and Cohen 1996; Pilcher and Bryant 2016). Dunne et al. (2018) conducted a survey among African-American adults that found that people with a high level of perceived social support are more likely to report greater satisfaction with life, and a study by Cao and Zhou (2019) replicated and extended this finding among individuals with SUD. Based on the current literature, we hypothesized that social support is positively associated with life satisfaction among individuals with SUD.

Social Support, Resilience and Life Satisfaction

Resilience may mediate the relationship between social support and life satisfaction. Resilience, a complex construct, has been conceptualized in different ways. Some experts in the field define resilience as a personality trait (Bajaj and Pande 2016; Block and Kremen 1996; Heeks and Ospina 2018), while some theorists regard resilience as a dynamic process (Masten 2001; Southwick et al. 2014). Masten (2001) denotes resilience as a phenomenon characterized by process, capacity, or good outcomes in the face of risk and adversity circumstances where adaptation or development is seriously threatened. This paper tends to conceptualize resilience as a dynamic and developmental process, suggesting that people are not born with resilience but gain it from life events. Scholars note that resilience can be generated from relational and social factors (e.g., family bonds and supportive relationships; Masten and Garmezy 1985), which are inverse predictors of substance abuse (Bahr et al. 1993; Urberg et al. 2005). Life for people with SUD can be quite afflictive and difficult because they are more likely to encounter problems such as health-related issues (Herrenkohl et al. 2013), financial stress (Boardman et al. 2001), inadequate health-care services (French et al. 2000), social exclusion and discrimination (Person et al. 2007), and psychiatric disorders (Bing et al. 2001). However, resilience can help individuals with SUD to actively and successfully adapt to and cope with the difficulties they confronted (Wingo et al. 2014). Previous studies have observed that levels of life satisfaction for those with SUD are not identical and uniform (Yang et al. 2018). Under the framing of resilience theory, Masten (2001) found that most risk factors are index-continuous with bipolar dimensions that end positively with desired outcomes and negatively with adverse outcomes. It is widely accepted that high levels of social and psychological assets are linked with greater mental health (Benson et al. 1999; Paakkari et al. 2019).

Social support has been found to be positively related to resilience (Rzeszutek 2017). Wolf et al. (2017) pointed out that social support helps prevent rumination and suppressive emotions, and thereby enhances psychological resilience after the occurrence of depressive symptoms. Internal and external social support of individuals protects people against risk factors and leads to a higher level of resilience, and research also shows that resilience is beneficial to enhancement of subjective well-being (Liu et al. 2013b). Some studies have shown that resilience is positively related to life satisfaction (Bajaj and Pande 2016; Hu et al. 2015; Singh and Yu 2010). When faced with adversity, resilience can increase capability for maintaining or restoring life satisfaction (Exenberger and Juen 2014). Empirical studies found that strong social networks and healthy relationships are predictors of resilience that can generate positive life outcomes (Schultz et al. 2009). Under this framing, social support may act as an "asset" that fosters resilience to gaining life satisfaction in people with SUD. Integrating the above concepts with literature, it seems rational to form the hypothesis that resilience may mediate the relationship between social support and life satisfaction.

Social Support, Positive Affect and Life Satisfaction

Positive affect may act as another mediator between social support and life satisfaction. Both theoretical and empirical studies have explored the relationships among social support, positive affect, and life satisfaction (Jayawickreme et al. 2017; Rzeszutek 2017). Positive affect broadens the repertoire of thought movements, formulating a flexible and positive mental state (Tugade and Fredrickson 2004) and promoting successful adjustment to adversity (Lightsey et al. 2013; Tugade et al. 2004). Numerous studies have shown that social support is positively linked with positive affect (Diaz and Bui 2017; Sheridan et al. 2010). According to Kong et al. (2013), people with high levels of social support achieve higher positive emotional scores than those with low levels of social support. Contrary to the active role of social support, social constraints may block psychological recovery by impeding discussion and the cognition process of trauma (Lepore 2001), which is negatively linked with positive affect (Sheridan et al. 2010).

Positive affect has a vital impact on life satisfaction and is also a protective factor influencing physical and psychological well-being (Folkman and Moskowitz 2000). The literature reveals that positive affect is positively linked with life satisfaction (Extremera and Rey 2016; Kuppens et al. 2008) and may encourage individuals through non-drug-related rewards, helping them sustain changes in cognitive behaviors

individuals and ultimately achieve drug avoidance (Carrico et al. 2013). Such a spiraling rise of lifestyle changes may explain how positive affect promotes long-term healthy behavior and life satisfaction. The positive affect experienced in mentally and physically healthy behaviors promotes salience of non-conscious motives for the cues associated with these behaviors, which implicitly encourage individuals to maintain those healthy behaviors (Cappellen et al. 2017). Besides, positive affect can change individuals' appraisal regarding pressures, and this may be beneficial to rearrangement of internal mental resources and improvement in life satisfaction (Zhang 2016). In addition, Zhu (2015) conducted an empirical study in 430 Chinese university students and found that affect balance mediates the relationship between social support and life satisfaction. Moreover, Kong et al. (2019) found that positive affect acted as a mediator between social support and life satisfaction among 748 Chinese adults. We therefore speculate that positive affect can mediate the relationship between social support and life satisfaction among drug users.

Social Support, Resilience, Positive Affect, and Life Satisfaction

There is strong evidence that resilience is beneficial for increasing individuals' positive affect (Bajaj and Pande 2016; Liu et al. 2012). People with greater resilience can more successfully cope with life stressors and promote good psychological outcomes such as positive affect (Wang et al. 2017). For example, substance users with supportive parents and friends may experience increased levels of resilience (Yang et al. 2018), that in turn can bolster their feelings of positive affect (Carle and Chassin 2004). A prior study found that positive affect fully mediates the relationship between resilience and life satisfaction (Liu et al. 2012). These protective mechanisms denote the processes of how individuals develop appropriate countermeasures and maintain mental health in the face of substance-induced adversities (Masten et al. 1990; Rutter 1987). Based on all observed literature, this study hypothesized that perceived social support exerts an indirect effect on life satisfaction through the chained mediating effect of resilience-positive affect.

The Current Study

This study considered another concern, the role of gender in the association between social support and life satisfaction among people with SUD. Considerable research has found that men score higher on life satisfaction than women (Moksnes and Espnes 2013), although some studies found no gender difference with respect to life satisfaction (Salimi 2011). Fergusson and Horwood (2003) found that the process of resilience may also vary between males and females. A study conducted by Zhang et al. (2018) proved that gender differences existed among college students while examining the effects of resilience and perceived social support on psychological distress. Moreover, previous literature reveals that gender differences exist in the studies which examined associations between social support and life satisfaction (Matud et al. 2014), and between positive affect and life satisfaction (Zhang 2016). Differences in development, socialization, and values between men and women lead to variations in the way they buffer against the negative impacts of substance use. However, to our knowledge, no studies have yet investigated whether the mediating mechanisms of resilience and positive affect underlying the association between social support and life satisfaction differ by gender among individuals with SUD. To develop effective prevention and intervention strategies for both males and females with SUD, gender difference in this mediational mechanism should be considered.

Previous studies have indicated that the "multi-mediator variable" model is more effective than the "single mediator variable" model in terms of framing potential correlations between variables (O'Rourke and Mackinnon 2015; Taylor et al. 2015). The purpose of this study was to validate the mediating effects of resilience and positive affect in the relationship between social support and life satisfaction. In addition, these hypotheses might differ by gender. Based on previous studies, we proposed the following hypotheses: (1) Social support is positively associated with life satisfaction. (2) Resilience mediates the relationship between social support and life satisfaction. (3) Positive affect mediates the relationship between social support and life satisfaction. (4) Social support has an indirect effect on life satisfaction through the mediating effect of resilience–positive affect. (5) There is gender difference in mediating effects of resilience and positive affect in the relationship between social support and life satisfaction. The detailed hypothesized model can be seen in Figs. 1.

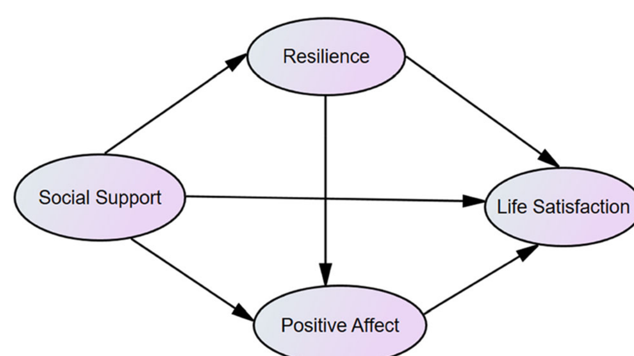

Fig. 1 The hypothesized model concerning the relationship between social support and life satisfaction: resilience and positive affect as mediators

Method

Participants and Procedure

Three hundred and ninety-seven drug users volunteered to take part in the study, approved by the Ethics Committee of Nanjing Medical University. There were 397 participants in the study (including 310 males and 87 females), all individuals with SUD from Nanjing in China. In the sample, 72.3% of participants' education levels were below middle school, while 50.1% of them were unemployed. Furthermore, 59.4% of the participants were relapsers, while 40.6% were receiving their first mandatory treatment. With respect to consumption history, 21.9% had used drugs less than 5 years, 32.2% had used drugs for 5–10 years, and 45.9% had used drugs for more than 10 years. With respect to their last time they had used drugs, 16.0% hadn't used drugs for 1 month, 24.8% hadn't used drugs for 1–3 months, 16.1% hadn't used drugs for 3–6 months, and 43.1% hadn't used drugs for more than half a year. Their demographic information, including age, gender, education, marital status, income, work status, and drug types, can be seen in Table 1. All participants were informed of the research purpose, the confidentiality procedures, and all signed a Written Informed Consent Form. The questionnaire took about 30 min to complete.

Social Support

The Multidimensional Scale of Perceived Social Support (MSPSS) using a seven-degree Likert scale (from 1 = very strongly disagree to 7 = very strongly agree), was developed to quantify social support (Zimet et al. 1988). The MSPSS focuses on three main subscales, viz., family, friends, and significant others. The Chinese version of MSPSS has exhibited excellent reliability and validity (Xia and Yang 2019). In this study, the Cronbach alpha coefficient for the MSPSS was 0.909.

Resilience

The 25-item Connor-Davidson Resilience Scale (CD-RISC) was administered to assess participants' resilience level (Connor and Davidson 2003). They were asked to rate the 25 items on a 5-point Likert scale (0 = not true at all, 1 = rarely

Table 1 Sample characteristics

Sample characteristics		Total(N = 397)		Male		Female	
		M	SD	n	%	n	%
Age (21–51 years)		38.4	9.2	–	–	–	–
		n	%				
Gender	0.Male	310	78.1	–	–	–	–
	1.Female	87	21.9	–	–	–	–
Education:($n = 389$)	1.Elementary school and below	73	18.4	62	20.0	11	12.6
	2.Middle school	214	53.9	161	51.9	53	60.9
	3.High school	74	18.6	61	19.7	13	14.9
	4.College	28	7.1	18	5.8	10	11.5
Marital status:($n = 395$)	1.Single	124	31.2	94	30.3	30	34.5
	2.Married	136	34.3	105	33.9	31	35.6
	3.Divorced	126	31.7	101	32.6	25	28.7
	4.Widowed	9	2.3	8	2.6	1	1.1
Annually income(yuan/year): ($n = 387$)	1. <10,000	100	25.2	65	21.0	35	40.2
	2. 10000–50,000	129	32.5	96	31.0	33	37.9
	3. 50000–100,000	86	21.7	73	23.5	13	14.9
	4. 100000–200,000	40	10.1	35	11.3	5	5.7
	>200,000	32	8.1	32	10.3	0	0
Work status:($n = 396$)	0. Unemployed	199	50.1	151	48.7	48	55.2
	1. Employed	197	5.3	17	159	38	44.8
Drug types	1. Heroin	95	23.9	76	24.5	19	21.8
	2.Methamphetamine	277	69.8	216	69.7	61	70.1
	3.others	25	6.3	18	5.8	7	8.0

true, 2 = sometimes true, 3 = often true, 4 = true nearly all of the time), and a higher score reflected a higher level of resilience experienced. This scale has demonstrated good reliability and validity for the Chinese population (Ni et al. 2016). The scale had a Cronbach alpha coefficient of 0.905 in this study.

Positive Affect

The Positive and Negative Affect Scale (PANAS) was developed to assess positive and negative affect (Watson et al. 1988), with positive affect (PA) comprised of 10 positive emotions (interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive, active). Participants were asked to rate their agreement on a 5-point Likert scale, ranging from 1 = very slight or not at all to 5 = many, with a higher score indicating greater positive emotion. This scale has demonstrated good reliability and validity for the Chinese population (Tu and Yang 2016). In our dataset, the PA scale had a Cronbach alpha coefficient of 0.840.

Life Satisfaction

Life satisfaction was assessed by the Satisfaction with Life Scale (SWLS) comprised of 5 brief statements (Diener et al. 1985). Each item was answered on a 7-point Likert scale ranging from 1 = strongly disagree to 7 = strongly agree. The SWLS has exhibited good reliability and validity for the Chinese population (Kong et al. 2018). In this study, the Cronbach alpha coefficient of the scale was 0.839.

Data Analysis

A Pearson correlation analysis was used to examine the associations between variables. IBM SPSS Statistics version 22 was operated to analyze descriptive statistics and intercorrelations.

Based on the statement of Anderson and Gerbing (1988), a two-step method was adopted to analyze mediation effects. First, confirmatory factor analysis was implemented for assessing the measurement model with four potential variables: social support, resilience, positive affect, and life satisfaction. Second, if model fit of measurement model showed satisfactory results, the structural equation model could be utilized for assessing the hypothesized pathway by the maximum likelihood (ML) estimation provided by the AMOS 24.0 program. With the aim of controlling inflated measurement errors induced by multiple items of the latent variable, we created parcels for three latent variables (perceived social support, resilience, and positive affect) by a random assignment approach (Little et al. 2002). Since the SWLS had only five indicators, life satisfaction was not parceled in the model.

Model fit was assessed by seven goodness-of-fit indices (Hu and Bentler 1999; Siedlecki et al. 2014): Chi-square/df, Standardized Root-Mean-Square Residual (SRMR), Root-Mean-Square Error of Approximation (RMSEA), Adjusted Goodness of Fit Index (AGFI), Comparative Fit Index (CFI), Akaike Information Criterion (AIC), and Expected Cross-Validation Index (ECVI). A satisfactory value of Chi-square/df was between 1 and 3. Satisfactory fit was indicated by an SRMR value of ≤ 0.06, an RMSEA value of ≤ 0.08, an AGFI value of ≥ 0.90, and a CFI value of ≥ 0.90. We also used AIC and ECVI to compare model fit; specifically, a smaller value of AIC represents a better fit (Akaike 1987) and a lower value of ECVI indicated greater potential for replication (Browne and Cudeck 1993).

Results

Preliminary Analyses

Table 2 contains descriptive statistics, including Means, Standard Deviations (SD), reliability estimates (Cronbach's

Table 2 Means, standard deviations (SD), Skewness, Kurtosis, reliabilities and bivariate correlations among study variables after controlling the effects of gender, income and work conditions

Measure	Mean	SD	α	1	2	3	4
1. Perceived social support	4.38	13.60	0.909	1			
2. Resilience	3.11	16.41	0.905	0.488**	1		
3. Positive affect	2.55	7.11	0.840	0.110*	0.275**	1	
4. Life satisfaction	3.29	6.55	0.839	0.242**	0.233**	0.192**	1

Note: α = Cronbach's alpha

Gender coded by 0 = male, 1 = female

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation is significant at the 0.01 level (2-tailed)

alpha coefficients), and correlations for all the study variables, considering gender, income, and work condition as covariates. The results indicated that all correlations among perceived social support, resilience, positive affect and life satisfaction were proven to be statistically significant ($p < 0.01$).

Measurement Model

The measurement model included four latent factors (perceived social support, resilience, positive affect, and life satisfaction) and twelve observed variables. Although the initial measurement model was not satisfied. as a modification index the error terms of life satisfaction were correlated, after which the revised model was proven to achieve a satisfactorily fit with the data ($\chi^2 = 125.823$, df = 45, χ^2/df = 2.796, $p < 0.001$; SRMR = 0.0529; RMSEA =0.067; AGFI = 0.914; and CFI = 0.964, CFA). All latent variable factor loadings were reliable ($p < 0.01$), and fitting results showed the respective indicators could satisfactorily represent all latent variables.

Structural Model

In the absence of a mediator, the direct path coefficients from the predictor (perceived social support) to the criterion (life satisfaction, $\beta = 0.227$, $p < 0.01$) were reliable. We first built a partially-mediated model (Model 1) with two mediators and the direct paths from perceived social support to life satisfaction revealed a good fit to the data ($\chi2 = 151.866$, df = 46, $\chi2$/df = 3.301, $p < 0.001$; SRMR = 0.0681; RMSEA = 0.076, AGFI = 0.899, CFI = 0.953, AIC = 215.866, and ECVI = 0.545), except for the indices of χ^2/df, SRMR, and AGFI. Moreover, since the coefficient of the path from social support to life satisfaction was not significant ($\beta = 0.016$, $p = 0.231$) in Model 1, we built a full partial-mediator model based on Model 1 by deleting the path from social support to life satisfaction (Model 2), yielding results indicating that the modified model fit the data well ($\chi2 = 153.310$, df = 47, $p < 0.001$; $\chi2$ / df = 3.262, SRMR = 0.0716; RMSEA = 0.076, AGFI = 0.901, CFI = 0.953, AIC = 215.310, and ECVI = 0.544), except that the indices of $\chi2$/df and SRMR and all the coefficients of the paths were significant. When comparing Model 2 to Model 1, a larger AGFI value and smaller AIC and ECVI values indicated that the fit of Model 2 was more satisfactory.

Next, to test the distal mediating effect based on Model 2, a path from resilience to positive affect (Model 3) was added to the full mediating test model, and test results showed that this revised model fit the data well ($\chi2 = 127.850$, df = 46, $p < 0.001$; $\chi2$/df = 2.779, SRMR = 0.0585; RMSEA = 0.067, AGFI = 0.915, CFI = 0.964, AIC = 191.850, and ECVI = 0.484), although the standardized path coefficient between social support and positive affect in model 3 was not significant. Finally, based on Model 3, we built Model 4 by deleting the insignificant path, with results showing that the advanced model fit the data well; all the standardized path coefficients were significant. While test results revealed no differences between Model 3 and Model 4 in terms of the merits of the fitting index, smaller AIC and ECVI values suggested that Model 4 was more satisfactory, so Model 4 was chosen as the most suitable model for evaluating mediating effects among the four competing models (Table 3). The final model is shown in Fig. 2.

We used the bootstrapping procedure of AMOS 24.0 to test the significance of the models. In accordance with MacKinnon et al. (2004), 10,000 samples were generated by random sampling of the original dataset ($N = 397$) after controlling the effects of gender, income, and work condition. If the outcome of the mediation effect within the 95% confidence interval did not contain zero, the mediation effect would be significant at the 0.05 level. Table 4 displays the indirect effects and their associated 95% confidence intervals, indicating that the perceived social support exerted significant indirect effects on life satisfaction and resilience via positive affect.

Table 3 Fit indices among competing models

Model	χ2	df	χ2/df	SRMR	RMSEA	AGFI	CFI	AIC	ECVI
CFA	125.823	45	2.796	0.0529	0.067	0.914	0.964	191.823	0.484
Model 1	151.866	46	3.301	0.0681	0.076	0.899	0.953	215.866	0.545
Model 2	153.310	47	3.262	0.0716	0.076	0.901	0.953	215.310	0.544
Model3	127.850	46	2.779	0.0585	0.067	0.915	0.964	191.850	0.484
Model 4	129.359	47	2.752	0.0581	0.067	0.916	0.963	191.359	0.483

Note: N = 397; *SRMR* Standardized Root Mean Square Residual, *RMSEA* Root Mean Square Error of Approximation, *AGFI* Adjusted Goodness of Fit Index, *CFI* Comparative Fit Index, *AIC* Akaike Information Criterion, *ECVI* Expected Cross-Validation Index

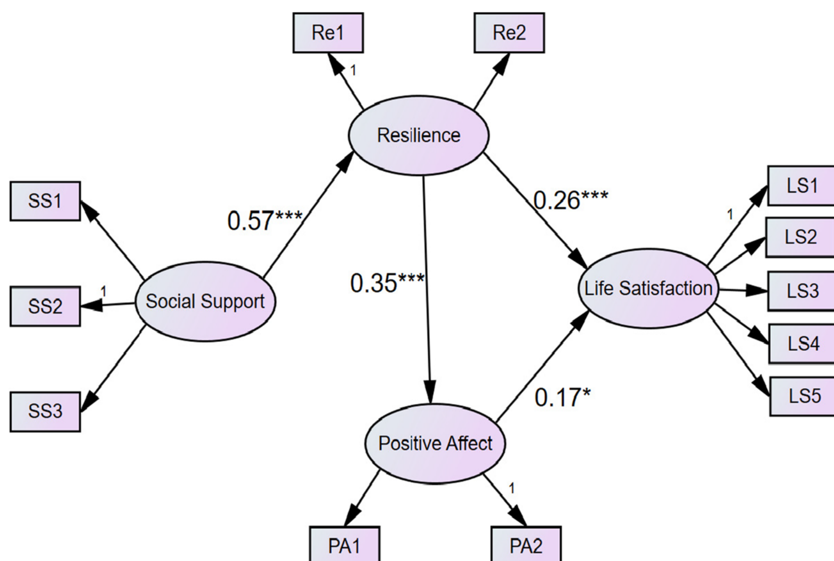

Fig. 2 The finalized structural model (N = 397) in the present study. Note. Factor loading are standardized. Support = Perceived social support; SS1-SS3 = Three parcels of social support; SS1 = family support, SS2 = friend support and SS3 = specialist support; LS1–LS5 = Five parcels of life satisfaction; Re1–Re2 = Two parcels of Resilience; PA1–PA2 = Two parcels of positive affect

Gender Differences

The results showed that there were significant positive associations among social support, resilience, positive affect, and life satisfaction after controlling the effects of gender, and females scored higher than males with respect to perceived social support.

To further examine gender differences, we conducted a multi-group analysis to identify whether the path coefficients significantly differed between males and females. In accordance with Byrne (2001), two models were used to compare the gender difference: (1) An unconstrained model. Allowing all the paths to vary across male and female groups; (2) A constrained model, constraining all the parameters, including factor loading, error variances and structure covariance to be equal across male and female groups. After confirmed the moderating effect of gender, we examined the mediating models separately for men and women, and the results showed that differences between these two models were not significant ($\triangle\chi 2(16) = 25.997$, $p = 0.054$). Furthermore, based on the recommendation of Arbuckle (2003), we used the critical ratios of differences (CRD), estimated by dividing the difference between two estimates by an estimate of the standard error of the difference, with the aim of judging the difference between two parameter estimates. If a CRD was higher than 1.96 (or 2.58), the two parameters were judged to be significantly different at $p < 0.05$(or $p < 0.01$). The CRD analysis indicated that the structural path from resilience to positive affect was significantly different (CRD = 3.061, $P < 0.01$), and the path coefficient for females ($\beta = 0.66$, $p < 0.001$) was much more significant than that for males ($\beta = 0.26$, $p < 0.01$). The results showed that females with high resilience scores are more likely to achieve greater positive affect than males Fig. 2.

Table 4 Bootstrapping indirect effects and 95% confidence intervals (CI) for the final mediational model after controlling for gender, income and work condition

Model pathways	Point estimates	95%CI	
		Lower	Upper
Perceived social support → Resilience →Life satisfaction	.0356	.00-17	.0743
Perceived social support → Resilience→ Positive Affect	.0750	.04-28	.1138
Perceived social support → Resilience→ Positive Affect→ Life satisfaction	.0098	.00-27	.0219
Resilience→ Positive Affect→ Life satisfaction	.0151	.00-42	0.0334

Discussion

The present study was designed to analyze the mediating role of resilience and positive affect on the relationship between perceived social support and life satisfaction. As we hypothesized, there is a positive correlation between social support and life satisfaction, consistent with previous studies (Koydemir et al. 2013; Yang et al. 2018). Social support has an indirect effect on life satisfaction through resilience and resilience-positive affect. The study proved that greater social support (i.e., a protective factor) plays a vital role in the resilience process and acts as an asset to promote positive affect (positive affect and life satisfaction), protecting people with SUD from substance-related diversities and adverse circumstances.

First, the findings revealed that resilience significantly mediates the relationship between perceived social support and life satisfaction, and resilience also has effect on positive affect, supporting the research hypothesis. The results of this study are in line with previous studies focusing on examining the relationships among social support, resilience, and life satisfaction (Liu et al. 2013b; Schultz et al. 2009), as well as the studies of the association between resilience and positive affect (Bajaj and Pande 2016). A substantial body of studies suggests that perceived social support is capable of protecting people from the adverse effects of stressful events and improving their social adaptability (Cohen and Wills 1985; Jaffar et al. 2019; Wilcox 1981). Resilience properties can mitigate the substance-related risk factors by strengthening emotional regulation (Wingo et al. 2014), and exerting positive effects on increasing life satisfaction in people with SUD (Longabaugh et al. 2010; Salmon et al. 2000). Referring to Masten's (2001) resilience theory, resilience is not static, but rather a dynamic process developed from life events. According to the compensatory model of resilience, although negative life experiences (e.g., maltreatment, violence, abuse, neglect) are usually associated with poor psychological outcomes (Espelage et al. 2012), protective assets (e.g., social support) may serve to buffer the negative influences of those diversities and foster resilience (Garmezy et al. 1984). The findings in the current study suggested that social support is a predictor of resilience and, in turn, improve life satisfaction and positive affect among people with SUD. The results are also consistent with existing studies that substance users with adequate social support tend to experience positive psychological outcomes (Cao and Zhou 2019). The theoretical underpinnings of the findings are that perceived social support, including support from family, friends, and specialists, help substance users to develop a greater level of resilience (Liu et al. 2013a; Worthington and Scherer 2004), promoting positive affections (Afifi and MacMillan 2011; Schultz et al. 2009) and a higher level of life satisfaction (Jayawickreme et al. 2017; Kuppens et al. 2008; Zhang 2016).

Second, the final model of this study revealed that the path 'social support →resilience →positive affect → life satisfaction' was significant. The evidence showed that individuals with high social support were prone to attain a higher level of resilience, possibly enhancing their positive affect and in turn producing a greater sense of life satisfaction (Liu et al. 2012; Mak et al. 2011). For one thing, this path showed that resilience is a mediator between social support and positive affect, in accordance with studies affirming that resilience has a significant association with social support (Liu et al. 2013a; Worthington and Scherer 2004). For another, this path indicated that positive affect may act as a mediator between resilience and life satisfaction, consistent with the findings that resilience played a vital role in promoting positive affect (Bajaj and Pande 2016; Liu et al. 2012), and that positive affect is closely correlated with life satisfaction (Jayawickreme et al. 2017). Above all, it is reasonable to speculate that resilience might play a mediating role in the association between social support and positive affect, while positive affect might act as a mediator between resilience and life satisfaction. Interventions on perceived social support may provide practical implications for enhancing resilience (excitement, delightfulness, activeness, calmness, and relaxation) and positive affect (optimism, enthusiasm, and patience), which ultimately contributes to higher life satisfaction. The findings indicate clinicians and practitioners regarding formulating strategies to promote resilience, positive affect, and life satisfaction for individuals with SUD.

Third, in the context of people with SUD, positive affect was not found to be significant in mediating the association between perceived social support and life satisfaction because social support was not significant in predicting positive affect. While this was inconsistent with previous findings (Kong et al. 2019; Oh et al. 2014; Zhu 2015), it showed that resilience is positively associated with positive affect, suggesting an indirect pathway from perceived social support to positive affect via resilience. The results indicated that perceived social support can lead to higher adaptive capacity in people with SUD. The results also suggest that resilience may fully mediate the relationship between perceived social support and positive affect among individuals with SUD. The theoretical underpinnings are easy to understand. People with SUD whose social networks are robust tend to receive more support and assistance, both beneficial for individuals seeking to overcome difficulties posted by substance-related issues, and more likely to maintain resilience and in turn promoting retaining of positive affection. This study highlights the significance of perceived social support and resilience on positive affect and life satisfaction among individuals with SUD. The findings also provide empirical evidence for practitioners and policy makers that substance abuse treatment and rehabilitation programs involving specific projects focused on building perceived social support and resilience are recommended because

such projects may be effective for increasing positive affect and life satisfaction of people with SUD.

The results also showed that, contrary to previous studies, the path from social support to life satisfaction did not differ by gender (Matud et al. 2014), although females were proven to receive higher levels of social support than males. These results, in agreement with previous literature (Ashton and Fuehrer 1993; Belle 1982; Fischer 1982; Luthar and Ciciolla 2015), may be explained by considering the different social roles men and women play. Women tend to speak out more about their experiences and feelings, while men seem more willing to present competitiveness, independence, and self-reliance characteristics to others (e.g., Bakan 1966; Deaux and LaFrance 1998; Olson and Shultz 1994). Specifically, when encountering difficulties, men are often expected to overcome difficulties through their own efforts rather than by seeking help from others (Hirsch 1979; Stokes and Wilson 1984). We also found females with high resilience scores more likely to attain greater positive affect than males. This may be interpreted by noting that women in difficulty may be more adapted to chronic pain and mental health problems (Aneshensel 1992; Hu et al. 2015; Ramírez-Maestre et al. 2004). However, in the present study gender differences had no significant impact on the final model.

The present study also had some limitations. First, because the data was adopted from "face-to-face" surveys in which individuals with SUD may tend to manipulate their feedback to meet personal needs, the results of the data tended to be biased. It is recommended to adopt a greater variety of assessment methods for reducing survey subjectivity. Second, cross-sectional data for determining causality between variables was adopted in this study, and in future studies use of longitudinal and experimental methods would be ideal for analyzing the underlying mechanisms between variables. Third, the results are based on two-dimensional measures that only considered two potential mediating roles. In future studies, other facets of social support could be better examined and other possible mediating factors such as loneliness, personality and happiness further explored for determining the relationship between social support and life satisfaction.

Conclusion

This research considerably expands insights into the underlying mechanisms between social support and life satisfaction in individuals with substance-use disorders. In addition, important pathways leading from social support through resilience and positive impact on life satisfaction further illustrate the complex relationships between these variables. Taking the present study into account, with the aim of enhancing the well-being, social integration, and life satisfaction of individuals with substance-use disorders, it is recommended that strategies focusing on promotion of social support, resilience, and positive affect be formulated.

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Compliance with Ethical Standards

Conflict of Interests The authors declare that they have no competing interests.

Ethical Statement All procedures conducted in research in relation to human participants are in accordance with the ethical standards of the institutional committees and with the Helsinki Declaration of 1964 and its subsequent amendments or similar ethical standards.

Ethical Approval The Ethics Committee of Nanjing Medical University approved the study. All participants signed informed consent before testing the study.

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