The relationship between antisocial personality and drug craving in Chinese male methamphetamine-dependent patients: the mediating role of alexithymia

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Research Article

Keywords: methamphetamine, antisocial personality, alexithymia, drug craving, addiction

Posted Date: April 20th, 2023
Abstract

Background

In patients with methamphetamine use disorder (MUD), antisocial personality disorder (ASPD) and alexithymia increase the risk of drug craving, but the relationship between the three of them is unclear. Therefore, this study explored the mediating role of alexithymia in the relationship between ASPD and drug craving.

Methods

We recruited 524 MUD patients at a drug rehabilitation center in Sichuan Province, China, and assessed ASPD with the Mini International Neuropsychiatric Interview (M.I.N.I.), methamphetamine craving with the Desire for Drugs Questionnaire (DDQ), and alexithymia with the Toronto Affective Disorder Scale (TAS-20).

Results

Compared with MUD patients without ASPD, MUD patients with ASPD had higher DDQ-desire and intention, DDQ-negative reinforcement and DDQ-total scores, as well as TAS-total and their subscale scores (all p < 0.05). Correlation analyses revealed a significant positive correlation between ASPD, alexithymia and drug craving. Mediating effect analysis further indicated that the relationship between ASPD and drug craving was mediated by alexithymia.

Conclusions

Our study demonstrates for the first time that alexithymia mediates the relationship between ASPD and drug craving, which may provide a new entry point for treating MUD with comorbid ASPD.

1. Introduction

Methamphetamine (MA) is reported to be one of the most widely used drugs in the world, after cannabis, opium and other stimulants (UNODC, 2019) and an increasing number of Chinese are using MA, with approximately more than half of all drug users were MA dependent patients in China (Commission, 2017). MA is highly addictive, and its abuse can lead to a variety of diseases including increased risk of HIV infection due to syringe sharing (Montoya et al., 2013; Parsons et al., 2013), cardiovascular disease (Kaye et al., 2007), cognitive impairment (Scott et al., 2007), and it can also lead to problems such as MA-induced psychosis due to oxidative stress and neurotoxicity (Trt Rungnrirundorn et al., 2021). Currently, there are no effective methods to prevent and treat methamphetamine use disorder (MUD), suggesting that this critical public health issue requires further understanding. Antisocial personality disorder (ASPD) is defined as irresponsible, exploitative, and violative behavior that violates the rights of others, and it is characterized by disregard for social norms and laws, irresponsibility, impulsivity, and aggression (Falkum et al., 2009). Comorbid personality disorders (PD) have a detrimental effect on treatment and
relapse in patients with MUD (Fletcher & Reback, 2013). Many studies have shown that substance use disorders (SUD) are associated with ASPD. For example, ASPD is a risk factor for MA dependence (C. Zhang et al., 2018), and studies have found that patients with ASPD are 3.7 times more at risk for MA use than those without ASPD (T. Rungnirundorn et al., 2017), and their abuse is more severe (Fletcher et al., 2018). This may be due to the tendency of patients with ASPD features to use substances to cope with stress and unpleasant feelings, which is close to the self-medication theory.

Alexithymia is a cognitive tendency to have difficulty identifying and describing one’s own and others’ emotions as well as external orientations. People with alexithymia lack imagination and empathy, so they have poor comprehension of mood changes (Mahapatra & Sharma, 2018). In turn, difficulties in identifying emotions are associated with MA use and relapse (Cui et al., 2021). Numerous studies have shown a strong relationship between alexithymia and addiction, such as heroin addiction (Psederska et al., 2019), alcohol addiction (Thorberg et al., 2019), internet addiction (Mahapatra & Sharma, 2018), and pathological gambling (Marchetti et al., 2019). Cui et al. (2021) found that the prevalence of alexithymia in MUD patients was 23% compared to 16.67% in the healthy controls. Long-term MA use led to increased difficulty in identifying emotions in patients, but the duration of MA use was not related to the dimensions of difficulty describing feelings (DDF) and externally oriented thinking (EOT). Alexithymia leads to mood disorders and dysregulation in adolescents, increasing the risk of addiction and suicide in adulthood (De Berardis et al., 2017; De Berardis et al., 2020). A recent study found a link between alexithymia and relapse in patients with SUD (Palma-Lvarez et al., 2021). Alexithymia is associated with more severe addictions, such as increased substance use, strong compulsive medication thoughts, and higher levels of drug cravings (Cruise & Becerra, 2018). Although the mechanisms of how alexithymia affects substance use remain unclear, emotion regulation appears to play an important role in the relationship between alexithymia and drug craving. Recent studies have shown that alexithymia is associated with impulsivity and antisociality in heroin-dependent individuals (Psederska et al., 2019), which may be because ASPD and alexithymia share similar risk factors, such as family environment and childhood attachment (ZhaoChunxiao, 2020). However, there are no studies on the relationship between ASPD and alexithymia in MUD patients, which deserves further exploration.

Given the proven association between ASPD and alexithymia and their co-occurrence in SUD patients, we hypothesized that the association between ASPD and drug craving in MUD patients may be mediated by alexithymia. However, to our knowledge, no study has reported whether alexithymia mediates the association between ASPD and drug craving in MUD patients. Therefore, the main objective of this study was to investigate the relationship between ASPD, alexithymia, and drug craving in Chinese MUD patients. We hypothesized that (1) there would be a significant correlation between ASPD, alexithymia and drug craving in MUD patients, and (2) alexithymia would mediate the relationship between ASPD and drug craving.

2. Methods

2.1. Subjects
From September 2020 to July 2021, 524 eligible MUD patients were recruited to participate in this study at a drug rehabilitation facility in Mianyang, Sichuan Province, China. Inclusion criteria included 1) Han Chinese males aged 18–55 years, 2) positive urine testing for MA, 3) meeting the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) criteria for MUD, and 4) MA use only, with no comorbid other substance abuse. Exclusion criteria included 1) severe organic brain disease, such as craniocerebral injury; 2) comorbid severe heart, liver, and kidney disease; and 3) infectious and immune system disorders.

The Ethics Committee of the Institute of Chinese Academy of Sciences approved the study. A detailed explanation was given to all subjects and their signed informed consent was obtained.

2.2. Measurements

The Mini International Neuropsychiatric Interview (M.I.N.I.) was used in this study to determine the presence of ASPD in patients with MUD. The M.I.N.I. is a valid and reliable definitive interview tool for screening and diagnosing psychiatric disorders in DSM-IV and ICD-10 (Sheehan et al., 1998). The Chinese version of M.I.N.I. has shown high reliability and consistency of validity assessment in the diagnosis of psychiatric disorders (Si et al., 2009).

The Toronto Affective Disorder Scale (TAS-20) was used to assess affective disorders or difficulties with emotional expression. This refers to personality traits such as inability to express emotions and feelings appropriately, lack of imagination, and overly specific and rigid thinking. This 20-item scale consists of three main dimensions, measuring difficulty identifying feelings (DIF) and difficulty describing feelings (DDF) and externally oriented thinking (EOT). Higher total scores indicate higher levels of alexithymia; scores of 0–51 indicate no alexithymia; scores of 52–60 indicate tendencies to have alexithymia; and scores of > 60 indicate alexithymia (Bagby et al., 1994).

The Desire for Drug Questionnaire (DDQ) was used to test the participant’s current level of drug craving. The DDQ was divided into three dimensions: Desire and Intention, Negative Reinforcement and Control. Lower scores on the Desire and Intention and Negative Reinforcement dimensions indicated that participants had lower levels of craving for MA. In contrast, higher scores on the Control dimension indicated that participants were better able to control their cravings for MA. The Cronbach's alpha score for the scale was 0.909 (Franken et al., 2002).

2.3. Statistical analysis

First, the Kolmogorov-Smirnov one-sample test was used to assess the of normality of the sociodemographic and MA use characteristics continuous variables. Second, we described the sociodemographic and MA use characteristic of the participants and divided the participants into ASPD and non-ASPD groups. Then, we compared the prevalence of alexithymia among patients with or without ASPD. Third, a \( \chi^2 \) test was used for categorical variables, while an analysis of variance (ANOVA) was used for continuous variables to compare the differences between MUD patients with and without ASPD. Fourth, Pearson correlation or Spearman correlation was used to determine the correlation between ASPD,
alexithymia, and drug craving. Finally, a mediating effects model was constructed to assess the direct and indirect effects of ASPD on drug craving. ASPD was the independent variable (X), alexithymia was the mediating variable (M), and drug craving was the outcome variable (Y). Mediated analyses were conducted using PROCESS module version 4.1, and we used Bootstrapping with 5000 samples to test the significance of indirect effects. The indirect effect of ASPD on drug craving was significant when the 95% confidence interval (CI) did not exceed 0. Path a represented the association between ASPD and alexithymia; path b demonstrated the association between alexithymia and drug craving; a x b was the indirect effect of ASPD on drug craving via alexithymia; path c represented the total effect of ASPD on drug craving and path c' represented the direct effect of ASPD on drug craving.

All statistical analyses were performed in SPSS version 26.0, and p-values were two-tailed at the 0.05 level of significance.

3. Results

3.1. Sample characteristics

Among MUD patients, the prevalence of ASPD was 20.99% (110/524). Further, the prevalence of alexithymia was 34.55% (38/110) in the ASPD group and 27.05% (112/414) in the non-ASPD group. Table 1 shows the sociodemographic, clinical, and MA use characteristics of the ASPD and non-ASPD groups. We found that education (F = 4.745, P = 0.030), duration of MA use (F = 11.462, P = 0.001), dose of MA use (F = 12.208, P = 0.001) and age at first MA use (F = 23.917, P < 0.001) showed significant differences between the two groups.
### Table 1
Demographic and clinical characteristics in ASPD group and non-ASPD group

<table>
<thead>
<tr>
<th></th>
<th>Total (n = 524)</th>
<th>ASPD group (n = 110)</th>
<th>Non-ASPD group (n = 414)</th>
<th>F/χ²</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>34.33 ± 6.70</td>
<td>32.67 ± 6.15</td>
<td>34.77 ± 7.15</td>
<td>7.91</td>
<td>0.005*</td>
</tr>
<tr>
<td>Education (years)</td>
<td>9.47 ± 2.30</td>
<td>9.05 ± 2.07</td>
<td>9.58 ± 2.34</td>
<td>4.75</td>
<td>0.03*</td>
</tr>
<tr>
<td>BMI</td>
<td>23.58 ± 4.69</td>
<td>23.62 ± 4.79</td>
<td>23.57 ± 4.67</td>
<td>0.10</td>
<td>0.919</td>
</tr>
<tr>
<td>Drinking history</td>
<td></td>
<td></td>
<td></td>
<td>1.31</td>
<td>0.253</td>
</tr>
<tr>
<td>Smoking history</td>
<td></td>
<td></td>
<td></td>
<td>4.15</td>
<td>0.125</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td>8.95</td>
<td>0.062</td>
</tr>
<tr>
<td>Duration of MA use (months)</td>
<td>96.77 ± 48.36</td>
<td>110.59 ± 41.61</td>
<td>93.14 ± 49.39</td>
<td>11.46</td>
<td>0.001**</td>
</tr>
<tr>
<td>Age of first MA use (years)</td>
<td>25.12 ± 7.43</td>
<td>22.08 ± 6.35</td>
<td>25.92 ± 7.50</td>
<td>23.92</td>
<td>0.000***</td>
</tr>
<tr>
<td>Withdrawal period (months)</td>
<td>14.65 ± 6.44</td>
<td>15.53 ± 5.87</td>
<td>14.42 ± 6.57</td>
<td>2.48</td>
<td>0.116</td>
</tr>
<tr>
<td>Dose of MA use (g)</td>
<td>1090.93 ± 2564.74</td>
<td>1848.64 ± 2564.74</td>
<td>888.37 ± 2191.74</td>
<td>12.21</td>
<td>0.001**</td>
</tr>
<tr>
<td><strong>ASPD</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TAS-DIF</td>
<td>18.94 ± 4.92</td>
<td>20.29 ± 4.56</td>
<td>18.59 ± 4.98</td>
<td>10.57</td>
<td>0.001**</td>
</tr>
<tr>
<td>TAS-DDF</td>
<td>14.88 ± 2.70</td>
<td>15.54 ± 2.41</td>
<td>14.70 ± 2.75</td>
<td>8.41</td>
<td>0.004**</td>
</tr>
<tr>
<td>TAS-EOT</td>
<td>21.68 ± 2.98</td>
<td>21.46 ± 2.96</td>
<td>22.51 ± 2.91</td>
<td>11.07</td>
<td>0.001**</td>
</tr>
<tr>
<td>TAS-tatal</td>
<td>55.35 ± 8.43</td>
<td>57.82 ± 7.47</td>
<td>54.69 ± 8.56</td>
<td>12.17</td>
<td>0.001**</td>
</tr>
<tr>
<td>DDQ – desire and intention</td>
<td>1.60 ± 0.87</td>
<td>1.91 ± 1.05</td>
<td>1.51 ± 0.80</td>
<td>19.02</td>
<td>0.000***</td>
</tr>
<tr>
<td>DDQ – negative reinforcement</td>
<td>1.72 ± 1.07</td>
<td>2.12 ± 1.34</td>
<td>1.61 ± 0.95</td>
<td>20.72</td>
<td>0.000***</td>
</tr>
<tr>
<td>DDQ – control</td>
<td>3.03 ± 1.83</td>
<td><strong>3.03</strong> ± 1.65</td>
<td>3.03 ± 1.87</td>
<td>0.00</td>
<td>0.971</td>
</tr>
<tr>
<td>DDQ – total</td>
<td>6.35 ± 2.92</td>
<td>7.07 ± 3.04</td>
<td>6.14 ± 2.86</td>
<td>11.07</td>
<td>0.001**</td>
</tr>
</tbody>
</table>

Note: BMI = body mass index, ASPD = Antisocial personality disorder; TAS = Toronto Alexithymia Scale; DDQ = Desire for Drug Questionnaire

The significance of bold emphases in the table is p < 0.05.

*P < 0.05; **P < 0.01; ***P < 0.001.
In addition, compared with MUD patients without ASPD, MUD patients with ASPD had significantly higher DDQ total score (F = 8.798, P = 0.003), DDQ-desire and intention (F = 19.022, P < 0.001), and DDQ-negative reinforcement scores (F = 20.724, P < 0.001), as well as higher TAS total score (F = 12.174, p = 0.001) and TAS-DIF (F = 10.570, p = 0.001), TAS-DDF (F = 8.406, p = 0.004) and TAS-EOT scores (F = 11.096, p = 0.001) (Table 1).

3.2. Correlation between ASPD, alexithymia, and drug craving in patients with MUD

Table 2 further shows the results of the correlation analysis between ASPD, alexithymia, and drug craving. Significant positive correlations were found between ASPD and alexithymia (r = 0.140, p = 0.001), alexithymia and drug craving (r = 0.099, p = 0.018), and ASPD and drug craving (r = 0.126, p = 0.004). Also, significant positive correlations were found between the DDQ subscale, TAS subscale, and ASPD (all p < 0.05), except for correlation between DDQ-control and ASPD or alexithymia (both p > 0.05).

<table>
<thead>
<tr>
<th></th>
<th>ASPD</th>
<th>TAS-DIF</th>
<th>TAS-DDF</th>
<th>TAS-EOT</th>
<th>TAS-total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASPD</td>
<td>—</td>
<td>0.131**</td>
<td>0.116**</td>
<td>0.136**</td>
<td>0.140**</td>
</tr>
<tr>
<td>DDQ – desire and intention</td>
<td>0.160**</td>
<td>0.113**</td>
<td>0.089*</td>
<td>0.164**</td>
<td>0.106*</td>
</tr>
<tr>
<td>DDQ – negative reinforcement</td>
<td>0.154**</td>
<td>0.111**</td>
<td>0.090*</td>
<td>0.162**</td>
<td>0.133**</td>
</tr>
<tr>
<td>DDQ – control</td>
<td>0.12</td>
<td>0.043</td>
<td>0.078</td>
<td>-0.014</td>
<td>0.031</td>
</tr>
<tr>
<td>DDQ – total</td>
<td>0.126**</td>
<td>0.101*</td>
<td>0.107*</td>
<td>0.100*</td>
<td>0.099*</td>
</tr>
</tbody>
</table>

Note: ASPD = Antisocial personality disorder; TAS = Toronto Alexithymia Scale; DDQ = Desire for Drug Questionnaire

The significance of bold emphases in the table is p < 0.05.

*P < 0.05; **P < 0.01; ***P < 0.001.

3.3. Mediation effect of alexithymia between ASPD and drug craving in patients with MUD

We tested the proposed mediation model that alexithymia might moderate the association between ASPD and drug craving (Fig. 1). As shown in Fig. 1A, there was a significant indirect effect of ASPD on DDQ total score through TAS total score (a × b = 0.1059), a significant direct effect of ASPD on DDQ total score (c' = 0.8225, p = 0.0092, 95% CI [0.2046, 1.4405]), and a significant total effect of ASPD on DDQ total score (c = 0.9284, p = 0.0031, 95% CI [0.3149, 1.5419]). Also, there was a significant direct effect of ASPD on TAS total score (a = 3.0514, p = 0.0007, 95% CI [1.2925, 4.8104]), as well as a significant direct effect of TAS total score on DDQ total score (b = 0.0347, p = 0.0244, 95% CI [0.0045, 0.0649]).
Figure 1B shows a significant indirect effect \((a \times b = 0.0861, 95\% \text{ CI} [0.024, 0.1979])\), a significant direct effect \((c' = 0.8029, p = 0.0111, 95\% \text{ CI} [0.1836, 1.4221])\), and a significant total effect of mediating ASPD via TAS-DIF on DDQ total score \((c = 0.8890, p < 0.0047, 95\% \text{ CI} [0.2741, 1.5040])\).

In addition, Fig. 1C shows the mediating effect of TAS-DDF on ASPD and DDQ total scores. Through the mediating effect of TAS-DDF, the indirect effect \((a \times b = 0.0934, 95\% \text{ CI} [0.0094, 0.2118])\), direct effect \((c' = 0.8562, p = 0.0067, 95\% \text{ CI} [0.2379, 1.4745])\) and total effect \((c = 0.9496, p = 0.0026, 95\% \text{ CI} [0.3337, 1.5655])\) were significant.

By 5000 samples selection and bootstrap analysis, we found that the indirect effects \((a \times b = 0.1026, 95\% \text{ CI} [0.0135, 0.2347])\), direct effects \((c' = 0.8427, p = 0.0074, 95\% \text{ CI} [0.2269, 1.4584])\), and total effects of ASPD on drug craving \((c = 0.9453, p = 0.0025, 95\% \text{ CI} [0.3333, 1.5573])\) were statistically significant (Fig. 1D). Therefore, these results indicated that the association between ASPD and drug craving was partially mediated by alexithymia.

4. Discussion

This study is the first to examine the mediating role of alexithymia between ASPD and drug craving in patients with MUD. The following were the study’s main findings: 1) ASPD patients had significantly higher alexithymia and drug craving than non-ASPD patients; 2) there was a positive association between ASPD, alexithymia, and drug craving, respectively; and 3) alexithymia partially mediated the relationship between ASPD and drug craving.

We found that MUD patients with ASPD had more severe alexithymia than those without ASPD, suggesting a significant positive association between ASPD and alexithymia. A study found that violent offenders had impaired empathy-related emotion recognition compared to healthy controls (Seidel et al., 2013); impulsivity, aggression, and empathy predicted delinquent behavior in adolescents, and impulsivity and empathy also predicted alcohol use (Schmits & Glowacz, 2019). According to Soderstrom (2003), ASPD is an empathy disorder characterized by mood disorders and social brain dysfunction, including the amygdala, hippocampus, ventral gyrus and orbitofrontal cortex (these brain regions regulate dopamine activity). In contrast, alexithymia is usually associated with cognition and empathy (Ahmed & Hunter, 2014). This explains the interaction between ASPD and alexithymia. However, more studies should be conducted to verify whether ASPD and alexithymia in MUD patients share common biological mechanisms.

Another important finding of this study was that MUD patients with ASPD had stronger drug craving than those without ASPD, indicating a positive correlation between ASPD and drug craving. Therefore, a better understanding of ASPD in MUD may positively improve MA abuse and prevent MA relapse. Temporal patterns suggest that ASPD usually precedes the onset of MA use disorder (Kuitunen-Paul et al., 2021). Studies have shown that ASPD is a risk factor for patients with MUD (T. Rungrirundom et al., 2017) and also contributes to more severe substance use disorders (Fletcher et al., 2018). A previous study reported that the prevalence of ASPD among MA users was 71.4% (Chenxi Zhang et al., 2018), which was higher
than that in our current study, possibly due to our more stringent diagnostic criteria using M.I.N.I. This may be due to the fact that ASPD and MA dependence together damage brain regions in the prefrontal cortex (PFC) (C. Zhang et al., 2018). Liu et al. (2014) found that PFC gray matter volume was reduced in ASPD patients compared to healthy individuals, and that PFC dysfunction induced dysregulation of addiction-related limbic reward regions (Goldstein & Volkow, 2011). Another reason may be related to the role of dopamine in the comorbidity of MA dependence and PD (Dagher & Robbins, 2009). In alcohol abusers, ASPD is associated with dopamine and serotonin transporter genes (Reese et al., 2010). MA has also been shown to have neurotoxic effects on human serotonin neurons (Krasnova & Cadet, 2009), which may be another reason to explain the stronger drug cravings in ASPD patients.

Our results showed a significant positive correlation between alexithymia and drug craving in patients with MUD, which can be well explained by the fact that alexithymia can predict drug craving in patients with MUD. Craving is an essential manifestation of drug addiction and a critical factor in the maintenance and relapse of substance use (Antons et al., 2020). Similar results have previously been found in samples of other addicted patients. For example, Dorard et al. (2017) found a positive correlation between alexithymia and marijuana use disorder. Lyvers M (2014) found that alexithymia led to increased consumption in caffeine-dependent individuals. Gao et al. (2018) found that alexithymia had a positive effect on addictive behavior in phone-dependent individuals. Similar results were found in patients with MUD, where patient with alexithymia used drugs more frequently than those without alexithymia, and the TAS total score and its subscales DIF and DDF were positively correlated with the frequency of MA use (Huang et al., 2022). These findings are consistent with our results in this study demonstrating an association between alexithymia and drug craving. This may be related to the following mechanisms. Patients with alexithymia who cannot accurately identify emotions often resort to ineffective emotion regulation methods when faced with stressful and unpleasant life experiences, leading to a prolonged accumulation of negative emotions (Panayiotou et al., 2015), and take measures such as substance abuse to cope with these stressful and unpleasant (Newton et al., 2009). This means that when negative emotions arise, patients with alexithymia are more likely to use negative coping strategies to relieve stress and choose to use MA to escape pain and seek pleasure, leading to the maintenance and relapse of MA. A study has shown that alexithymia is associated with levels of depression and anxiety that can increase the risk of drug use (Palma-Lvarez et al., 2021). T1-weighted MRI-based measurements showed higher density around the left fusiform gyrus in marijuana users compared to marijuana non-users (Matochik et al., 2005); and the fusiform gyrus are a vital brain region that affects the functions associated with alexithymia (Xu et al., 2018). It is also possible that long-term MA use increases dopamine release, leading to increased dopamine levels, especially in the striatum (Yui et al., 2010), and that polymorphisms in the dopamine D2 receptor (DRD2) are genetic factors in alexithymia (Walter et al., 2011).

Notably, there was a strong inter-correlation between ASPD, alexithymia, and drug craving. This study found that the mediating role of alexithymia could explain the association between ASPD and drug craving in patients with MUD. In the mediation model, the direct and indirect effects of the TAS total score and its DIF, DDF, and EOT subscale scores were significant. This strongly indicates the importance of
alexithymia in the relationship between ASPD and MA addiction, suggesting that alexithymia may be a potential mechanism linking ASPD and drug craving and that interventions targeting alexithymia may have clinical implications in MA relapse prevention programs. Alexithymia can affect a person's ability to regulate emotions and is a risk factor for addictive behaviors in the ASPD population. This may be due to the lack of empathic ability of patients with ASPD to reduce their emotional perceptions (Rhee et al., 2020) and if effective methods of emotion regulation are not available, the resulting negative emotions may persist for a long time in patients with alexithymia (Panayiotou et al., 2015), which will lead their eventual use of drugs to escape from negative emotions such as loneliness and emptiness (Wearne & Cornish, 2018). Another possible reason is the common substance base involved in ASPD, alexithymia, and MA addiction mechanisms: dopamine (Dagher & Robbins, 2009; Soderstrom, 2003; Walter et al., 2011). Therefore, it is reasonable to assume that some patients with MUD use the coping strategies of alexithymia to deal with their ASPD’s adverse effects. However, patients with alexithymia are unable to engage in effective emotion regulation strategies and may even amplify this distress. Therefore, our study provides a possible therapeutic direction for alexithymia that may be effective in MUD comorbid ASPD.

Several limitations should be considered in this study. First, this study is cross-sectional, so it is not possible to determine whether alexithymia may lead to drug use or drug use may lead to alexithymia. Second, all participants in this study were from Sichuan province, and whether the results of this study can be generalized to a national scale needs to be further explored. Third, only male subjects were included in this study. Although a large body of evidence suggests that the prevalence of alexithymia did not show gender differences in patients with SUD (Berardis et al., 2020; Palma-Lvarez et al., 2021), implying that gender has no effect on the relationship between MA use, ASPD, and alexithymia, future studies should include more female patients to allow for gender balance. Fourth, prior psychiatric history was not collected, which may be a confounding factor requiring further confirmation.

In conclusion, the present study showed a positive inter-correlation between ASPD, alexithymia and MA craving. Furthermore, for the first-time, this study showed that alexithymia could mediate the relationship between ASPD and MA craving. Although the limitations of this study do not allow for a clear causal relationship, these results have important implications for understanding the role of alexithymia in drug craving and provide a clear entry point for addiction treatment, suggesting that rehabilitative treatment for alexithymia in MUD patients with ASPD may be a potentially effective treatment for MA craving and further prevention of MA relapse.

Declarations

Conflict of Interest

No conflict of interest was disclosed for each author.

References


Figures
Figure 1

Mediation path analysis among ASPD, alexithymia, and drug craving factors.

Note: BMI=body mass index, ASPD= Antisocial personality disorder; TAS= Toronto Alexithymia Scale; DDQ=Desire for Drug Questionnaire
A: Mediation model on TAS– total score. B: Mediation model on TAS-DIF. C: Mediation model on TAS-DDF. D: Mediation model on TAS-EOT.

a = the effect of ASPD on alexithymia; b = the effect of alexithymia on drug craving factors; a×b: the indirect effect of ASPD on drug craving factors; c = the total effect of ASPD on drug craving factors; c’ = the direct effect ASPD on drug craving factors. *p < 0.05, **p < 0.01, ***p < 0.001.