The Association of Drug-Use Characteristics and Active Coping Styles With Positive Affect in Patients With Heroin-Use Disorder and Methamphetamine-Use Disorder During the COVID-19 Pandemic

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Background: Positive affect (PA) is crucial for individuals to cope with the current pandemic and buffer the lingering fears after it, especially for patients with substance-use disorders (SUDs). The current study aimed to explore PA and its related factors during the COVID-19 pandemic in male patients with the heroin-use disorder (HUD) and patients with the methamphetamine-use disorder (MAUD), respectively.

Methods: A total of 325 male patients with SUDs (106 with HUD and 219 with MAUD, all were single-substance users) in a compulsory rehabilitation center underwent semi-structured interviews during the pandemic. The demographic information, drug-use characteristics, active coping styles (ACSs, by Simple Coping Style Questionnaire), and PA (by the Positive and Negative Affect Scale) of participants were collected and recorded.

Results: There were significant differences between the two groups in age, the proportion of full-time workers before the epidemic, duration of drug use, the proportion of patients with long-term withdrawal during the epidemic, cravings, ACS, and PA. Correlation and multiple linear regression analysis showed that duration of drug use, ACS, and stable jobs were significant predictive factors for PA in patients with HUD, while long-term withdrawal, ACS, and stable jobs during the epidemic were significant predictive factors for PA in patients with MAUD.

Conclusions: Our study demonstrated the factors for PA in patients with HUD and MAUD during the pandemic. The results provided a basis for the comprehensive understanding of the PA of patients with SUDs and the development of targeted treatments.

Keywords: COVID-19, substance use disorders, positive affect, withdrawal, craving

INTRODUCTION

The outbreak of COVID-19 has caught people off guard globally (1). General public events, such as the COVID-19 pandemic, have had an impact on the physical and mental health worldwide of people (2, 3). The uncertain prognosis, shortage of testing and treatment resources, increasing economic losses, and negative effects of home confinement on physical health (4) have worked as a cluster of stressors and inevitably brought anxiety and depression to individuals (5–7), with affected populations being the elderlies (8, 9), children (10–12), teenagers with low awareness of risk for infection (13), college students receiving online courses (14), and pregnant women who are unable to access medical care due to home confinement (15). For some of those with existing mental health disorders (16–18), the COVID-19 pandemic has aggravated their conditions (19, 20). Several recent studies have shown that some individuals may resort to addictive behaviors to relieve their stress during the pandemic, particularly alcohol abuse (21) and internet-related addictions (22, 23). Some studies also indicated that the mental problems of patients with the substance-use disorder (SUDs) could relapse (24, 25) or progress (26, 27) during the pandemic due to the social isolation under lockdowns; in some severe cases, the patients take overdoses on their own (28). Moreover, patients with preexisting SUDs are at an increased risk for adverse outcomes following COVID-19 infection (29–32). Thus, these patients are under greater pressure in the face of the pandemic, which needs the attention of health authorities.

Having realized the significant impact of the COVID-19 pandemic, many researchers began to focus on affect problems related to the pandemic, which may provide a basis for timely mental health services during the pandemic (33). However, these studies focused more on negative affect (NA) rather than on positive affect (PA) (34). In fact, it has been demonstrated that PA also plays an important role in coping with chronic stressors through improving social, intellectual, and physical conditions of patients (34, 35). PA also counteracts negative physiological effects of chronic stressors and reduces the likelihood of post-traumatic depression (36, 37), indicating that it may help patients recover from NA related to the pandemic (35, 38). Moreover, PA is involved in information processing (39–41), which also reflects its importance regarding the high information load during the pandemic. PA can also alleviate the negative physiological consequences caused by stress (42, 43), which is beneficial to the physical conditions of individuals to defend against the coronavirus. To sum up, PA plays a more valuable role than most people think in coping with the pandemic (44). Of note, PA is an important factor for treatment outcomes in patients with SUDs (45–47), with suppressed PA associated with poorer outcomes (48) and improved PA associated with a better perception of quality of life (49, 50). In conclusion, clarifying the factors related to PA for patients with SUDs is conducive for them to face the pandemic positively. Some prior studies have shown that active coping styles (ACSs, such as seeking social support from others, engaging in physical activities, and positive reappraisal) are associated with PA in the general population (51–53), which is the same during the COVID-19 pandemic (54–56).

To date, heroin (an opioid substance) and methamphetamine (MA, a stimulant) are the most widely abused illegal drugs across the world, especially in Asia (57). Previous studies have found differences in several clinical aspects, such as demographics (58), personality traits (59), and the process of addiction (60) between patients with the heroin-use disorder (HUD) and patients with the methamphetamine-use disorder (MAUD). However, no studies have compared PA-related factors between the two disorders, especially in the context of COVID-19. Therefore, the present study aims to explore the factors and latent differences of PA between patients with HUD and those with MAUD. In addition to ACS mentioned above, we also included some characteristics of drug use, such as duration of drug use, long-term withdrawal (i.e., with no drug use for at least 3 months), and cravings, as potential factors during the COVID-19. Since the COVID-19 pandemic is a once-in-a-lifetime stressor, we also proposed some key considerations in demographics. In this study, we also aim to explore the differences in demographics and drug-use characteristics between two groups of patients with different SUDs and identify the factors of PA for the two SUDs.

METHODS

Participants and Procedures

From July to September 2020, a total of 733 patients with SUDs (133 women and 600 men) admitted to a compulsory drug rehabilitation center (Changsha, Hunan Province, China) underwent semi-structured interviews by two trained psychiatrists. According to our aim, only 325 male patients with single HUD ($n = 106$) or MAUD ($n = 215$) were retained. The inclusion criteria were as follows: (1) patients diagnosed with HUD or MAUD based on DSM-5 and (2) with at least 2 weeks of withdrawal at the time of recruitment. The exclusion criteria were as follows: (1) patients diagnosed with other mental disorders, (2) with serious physical diseases, (3) with intellectual or cognitive impairment, and (4) who cannot understand the questionnaires.

This study was approved by the Ethics Committee of The Second Xiangya Hospital of Central South University. All the participants in the study provided written informed consent; they were informed that they could withdraw from the study at any time without needing to provide any reason, and all their information was confidential.

Measures

A combination of semi-structured interviews and self-reports of patients were included in this study.

Semi-structured Assessment for Drug Dependence and Alcoholism (SSADDA)

For the screening of SUDs and other mental disorders, SSADDA was originally developed by Yale University (61, 62). It has been translated into different languages and verified for its reliability and validity in the SUDs population (63, 64). SSADDA was translated by our team in 2017 and was tested for psychometric properties, which indicated that the Chinese version of SSADDA had good reliability and validity when applied in patients with

SUDs (65). SSADDA has two main functions: One is to diagnose SUDs based on DSM-5 (66), including the abuse of tobacco, alcohol, MA, ketamine, opioid, and other substance (such as marijuana); and the other function is to screen out other mental disorders, such as schizophrenia (67), ADHD (68), and depression (69). SSADDA also reflects the characteristics of substance use, such as the duration of drug use and frequency of most severe episodes (70), which can help psychiatrists take the drug-use history of subjects.

Self-Reported Characteristics of Drug Use During the COVID-19 Pandemic

The participants were asked two questions about the characteristics of drug use during the pandemic. The first question was "Since the beginning of the COVID-19 outbreak, have you used no substance at all for at least 3 months?" and "a long period of withdrawal" was recorded if the answer was "yes." The model for the assessment of previous long-term withdrawal experience of patients was established after SSADDA. The second question was "Since the beginning of the COVID-19 outbreak, what is the highest level of your craving for the substance you use?" and the level should be reported by the subject with the use of the Visual Analog Scale of Craving (VASC). VASC is a line segment bisected with the numbers of 0–10, with the leftmost number "0" representing "no cravings at all" and the rightmost number "10" representing "very strong and almost uncontrollable cravings" (71, 72).

Active Coping Style

The Simplified Coping Style Questionnaire (SCSQ) was used to evaluate the coping styles of the subjects. SCSQ (73) is an instrument with good reliability and validity and has been widely used in studies in China, especially during the pandemic (74, 75). It consists of two subscales that measure active and negative coping styles of participants with a Likert 4-point scale, with 0 representing "never" to 3 representing "always"; higher scores indicated a higher frequency of adopting the corresponding coping styles. For the purpose of our study, we only analyzed the total score of the ACS subscale, which has a Cronbach coefficient of 0.860.

Positive Affect

The PA of the participants was measured using the Chinese version of the Positive and Negative Affect Scale (73, 76), which is widely used in a variety of populations, including patients with SUDs. The original scale includes two subscales, i.e., subscales for PA and NA, respectively, with each one containing 10 words that describe the corresponding affect (e.g., energetic, cheerful, or pride for PA, and nervous, irritable, or confused for NA) during a certain period. Each item was rated with a Likert 5-point scale, with 0 = hardly and 4 = extremely. As this study was focused on PA, only the PA subscale was used for the analysis; its Cronbach coefficient in this study was 0.887.

Statistical Analysis

Independent-samples t-test was used to analyze the differences in demographic data, drug-use characteristics, ACS, and PA

TABLE 1 | Demographic information of patients with HUD and patients with MAUD.

Variables	Patients with HUD	Patients with MAUD	χ^2/t	p-value
	$n = 106$	$n = 219$		
Age	48.95 (7.24)	35.08 (6.93)	−16.675	<0.001
Education (years)	9.40 (2.96)	10.21 (3.21)	2.210	0.028
Marital status				
Married	46 (43.4)	102 (46.6)	0.291	0.590
Unmarried/devoiced	60 (56.6)	117 (53.4)		
Employment status				
Enterprises/self-employed	34 (32.1)	76 (34.7)	0.220	0.639
Part-time work/unemployed	72 (67.9)	143 (65.3)		

HUD, heroin-use disorder; MAUD, methamphetamine-use disorder.

between the two groups of patients with SUDs. Pearson's correlation was then used to analyze the relationship between the above clinical variables and PA. Finally, multiple linear regression analysis was performed for the two groups, respectively. PA was set as the dependent variable, and all variables with $p < 0.1$ in the previous correlation analysis were included as independent variables. Data analyses were performed using the SPSS software (version 23.0), with a significance level of $p < 0.05$ (two-tailed).

RESULTS

Comparison of Demographic Data Between Patients With HUD and Patients With MAUD

The demographic information of the two groups is presented in **Table 1**. Patients with HUD had significantly higher age than those with MAUD ($p < 0.001$) and significantly fewer years of education ($p = 0.028$). There was no significant difference in the marital (i.e., married, unmarried, or divorced) and employment status (i.e., full-time job, part-time job, or unemployed) between the two groups.

Comparison of Clinical Variables Between Patients With HUD and Patients With MAUD

The drug-use characteristics, ACS, and PA of the two groups are presented in **Table 2**. Duration of drug use was significantly longer in patients with HUD than in patients with MAUD ($p < 0.001$). A significantly higher proportion of the patients with HUD had a long-term withdrawal during the COVID-19 pandemic, as compared with those with MAUD ($p < 0.001$); the cravings during the epidemic in patients with HUD were significantly greater than in those with MAUD ($p < 0.001$). The scores of ACS and PA of patients with HUD were significantly lower than those in patients with MAUD (both $p < 0.001$).

TABLE 2 | Clinical variables of patients with HUD and patients with MAUD.

Variables	Patients with HUD	Patients with MAUD	χ^2/t	p-value
	n = 106	n = 219		
Duration of drug use (year)	23.41 (8.12)	9.47 (4.67)	−16.4111	<0.001
Long-term withdrawal during COVID-19				
Yes	20 (18.9)	160 (73.9)	84.890	<0.001
No	86 (81.1)	59 (26.9)		
Cravings during COVID-19	4.84 (2.93)	2.67 (2.26)	−6.719	<0.001
Total score of ACS	18.29 (5.00)	21.32 (6.46)	4.644	<0.001
Total score of PA	22.02 (5.20)	28.29 (6.78)	9.191	<0.001

HUD, heroin-use disorder; MAUD, methamphetamine-use disorder; ACS, active coping styles; PA, positive affect.

TABLE 3 | Correlation between clinical variables and positive affect in the two groups of patients.

Groups	Positive affect	p-value
Patients with HUD (n = 106)		
Age	−0.225	0.020
Education	−0.009	0.931
Marital status	−0.177	0.070
Employment status	0.240	0.013
Duration of drug use	−0.300	0.002
Long-term withdrawal	0.105	0.282
Cravings	0.052	0.596
ACS	0.250	0.010
Patients with MAUD (n = 219)		
Age	−0.140	0.038
Education	0.077	0.255
Marital status	−0.012	0.863
Employment status	0.199	0.003
Duration of drug use	0.009	0.896
Long-term withdrawal	0.274	<0.001
Cravings	−0.220	0.001
ACS	0.241	<0.001

HUD, heroin-use disorder; MAUD, methamphetamine-use disorder; ACS, active coping style.

Correlation Between Clinical Variables and PA in Patients With HUD and Patients With MAUD

Variables associated with PA for both SUDs are presented in **Table 3**. In patients with HUD, age ($r = −0.225$, $p = 0.020$), employment status ($r = 0.240$, $p = 0.013$), duration of drug use ($r = −0.300$, $p = 0.002$), and ACS ($r = 0.250$, $p = 0.010$) were significantly correlated with PA. In patients with MAUD, age ($r = −0.140$, $p = 0.038$), employment status ($r = 0.199$, $p = 0.003$), long-term withdrawal during COVID-19 ($r = 0.274$, $p < 0.001$), craving during the epidemic ($r = −0.220$, $p = 0.001$), and ACS ($r = −0.241$, $p < 0.001$) were significantly associated with PA.

Multiple Linear Regression of Clinical Variables to PA in Patients With HUD and Patients With MAUD

Multiple linear regression analysis was performed in patients with HUD and MAUD, respectively. PA was set as the dependent variable, and variables with $p < 0.1$ in the previous correlation analysis were taken as independent variables. The results (see **Table 4**) showed that duration of drug use ($\beta = −0.267$, $t = −2.954$, $p = 0.004$), ACS ($\beta = 0.204$, $t = −2.258$, $p = 0.026$), and stable job ($\beta = 0.201$, $t = 2.223$, $p = 0.028$) were significant predictive factors for PA ($F = 7.423$, $p < 0.001$, adjusted $R^2 = 0.155$) in patients with HUD, while long-term withdrawal during the pandemic ($\beta = 0.251$, $t = 3.986$, $p < 0.001$), ACS ($\beta = 0.226$, $t = 3.604$, $p < 0.001$), and stable job ($\beta = 0.165$, $t = 2.612$, $p = 0.010$) were significant predictive factors for PA ($F = 13.240$, $p < 0.001$, adjusted $R^2 = 0.144$) in patients with MAUD.

DISCUSSION

To our knowledge, this is the first study to examine PA in patients with HUD and patients with MAUD during the COVID-19 pandemic. The results showed significant differences in age, education, some drug-use characteristics (i.e., duration of drug use, long-term withdrawal, and cravings during the pandemic), ACS, and PA between the two groups. Correlation analysis showed that age, employment status, duration of drug use, and ACS were significantly associated with PA in patients with HUD, while age, employment status, long-term withdrawal during the pandemic, cravings during the pandemic, and ACS were significantly associated with PA in patients with MAUD. Multiple linear regression analysis indicated that the duration of drug use, ACS, and stable job were significant predictive factors for PA in patients with HUD, accounting for 15.5% of the variation; long-term withdrawal, ACS, and stable job were significant predictive factors for PA in patients with MAUD, accounting for 14.4% of the variation.

With regard to demographics, patients with HUD were at a significantly higher age than those with MAUD, which was consistent with previous studies (59). In our study, the mean age of patients with HUD was nearly 50 years, and the duration of heroin use for this group was 23.41(±8.12) years, which is equivalent to the elderly stage of the life cycle in patients with HUD (77), indicating the advanced age of this group. As a result, they are a vulnerable group to both physical and psychological problems (78) and need the attention of healthcare providers. The level of education in patients with HUD was significantly lower, which might be a barrier for these patients to gain knowledge of COVID-19; this was in line with some previous studies, which showed that people with low education levels scored low in surveys regarding the knowledge of COVID-19 (79). With regard to drug-use characteristics, the duration of drug use in patients with HUD was significantly longer than that in patients with MAUD, which is consistent with the fact that their age was highly correlated with the duration of drug use (59, 80). In general, the older patients were more vulnerable to physical illnesses as they had long-term use of harmful substances

TABLE 4 | Multiple linear regression of clinical variables to positive affect in the two groups of patients.

Predictors	β	t	p-value	F	Adjusted R^2
Patients with HUD (n = 106)					
Duration of drug use	−0.267	−2.954	0.004	7.423***	0.155
ACS	0.204	−2.258	0.026		
Stable job	0.201	2.223	0.028		
Patients with MAUD (n = 219)					
Long-term withdrawal	0.251	3.986	<0.001	13.240***	0.144
ACS	0.226	3.604	<0.001		
Stable job	0.165	2.612	0.010		

***p < 0.001; HUD, heroin-use disorder; MAUD, methamphetamine-use disorder; ACS, active coping style.

(81, 82), which may increase their risk for infection with COVID-19. During the pandemic, 73.9% of the patients with MAUD had a withdrawal for more than 3 months, while the percentage was only 26.9% in patients with HUD. A possible reason for this significant difference is that MA might be harder to get; according to a survey, the amount of MA seized by the police significantly decreased through April 2020, while the seizure of heroin remained unchanged (83). Furthermore, patients with HUD are often highly addicted to heroin, meaning that they are less likely to withdraw and more likely to relapse (84). Moreover, our study also found that patients with HUD had significantly stronger cravings than those with MAUD during the pandemic, indicating that the level of cravings is also a risk factor for drug withdrawal (85). Patients with HUD had significantly higher ASC scores than those with MAUD, indicating that the former had adopted more ACS during the epidemic. Finally, as compared to patients with HUD, those with MAUD scored higher in PA. A possible reason for this difference is that the patients with HUD were at a higher age. Previous studies have shown that elderlies usually have lower levels of PA than younger people due to their reduced daily activity (86–88) and chronic illnesses (89, 90). This might be related to the reduced ability to perceive PA in patients with HUD due to the damage of corresponding brain regions (91, 92). Our results reflected that the biological mechanisms that produce PA in patients with HUD are even more impaired, i.e., their PA is less likely to be aroused than users of stimulants in the face of stressors. Therefore, treatment with regard to biological mechanisms for such patients is needed in response to the pandemic.

Correlation and multiple linear regression analysis revealed a slight difference in predictive variables for patients with HUD and patients with MAUD. First, the duration of drug use was a predictive factor for PA in patients with HUD only, whereas long-term withdrawal during the epidemic was a predictive factor for PA in patients with MAUD only. This suggested that although drug-use characteristics are important factors for patients with SUDs, their effects may vary on patients using different substances. A significant finding of this study was that long-term withdrawal was a protective factor for PA in patients with MAUD. Prior studies on the mechanism showed that the processing ability of PA recovered with the withdrawal of patients with SUDs (93, 94), which was conducive to their outcomes (95).

Although some researchers suggested that lockdown-induced withdrawal might not be voluntary for those patients with SUDs, our results still showed the benefit of passive withdrawal due to inaccessibility to illicit drugs. Of note, the two groups shared two common predictive factors, one of which was the pre-pandemic employment status and the other was their ACS. As lockdowns led to some unemployment, the employment status of patients before the pandemic has become another point worth exploring. Studies showed that people who had long commutes for work or part-time or casual workers, such as migrant workers and retailers, are more likely to lose their jobs (96, 97), suggesting that they might be worse off under the stress of the pandemic compared to those with a secured job. This is in line with our results, which demonstrated that patients with stable jobs (e.g., employees of an enterprise or self-employers) had higher levels of PA than those with unstable jobs (e.g., casual workers or unemployed people). This might be due to the less financial pressure for those with stable jobs and who were more able to afford drugs and medical services they needed.

As mentioned above, ACS is positively correlated with PA (98, 99), which is consistent with our results. Due to the lockdowns, many people were confined to their homes (100, 101) and had to reduce activities and communication with others (102), which had an impact on those who were more dependent on others or circumstances (e.g., seeking social support from others and engaging in physical activities) in coping with stressors. Many public venues, such as public sports facilities and cultural centers, closed down during the pandemic, which also led to the reduction of activities (103, 104). Therefore, our results suggest that patients who are more dependent on external conditions need more help in coping with stressors, one of the approaches being the use of internal-driven active coping strategies, such as positive reappraisal and problem-solving-oriented strategies. Certainly, the whole point of doing this is to help them increase their PA.

Limitations

Despite the strength of this study, it still has some limitations. First, this is a cross-sectional study; thus, the causality of the variables could not be reflected. Longitudinal studies are needed to find the causal relationship between the variables and PA

in patients with SUDs. Second, this study is retrospective, and the data for analyses are from self-reports of patients, which might be subjective and limit the generalization of the results. Finally, female patients were not included in this study as female patients in the drug rehabilitation center only accounted for a very small portion at the time of our survey; thus, the gender balance was difficult to achieve with female patients included. Therefore, gender differences in PA of patients with SUDs need to be explored in future works.

CONCLUSIONS

In summary, this study explored the differences and factors of PA between patients with HUD and patients with MAUD during the COVID-19 epidemic. Patients with SUDs are both physically and mentally vulnerable to such infectious diseases and therefore need attention from healthcare providers.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Ethics Committee of the Second Xiangya Hospital

of Central South University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

TL and XZ designed and supervised this study. YW, LW, XW, and QY collected data. QW collated the raw data. JZ analyzed and interpreted the data. YW wrote the first draft of the manuscript. XZ, DW, HW, and CG discussed and revised the manuscript. All co-authors approved the version to be published.

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REFERENCES

1. Ferrara P, Albano L. COVID-19 and healthcare systems: What should we do next? *Public Health.* (2020) 185:1–2. doi: 10.1016/j.puhe.2020.05.014
2. Druss BG. Addressing the COVID-19 pandemic in populations with serious mental illness. *JAMA Psychiatry.* (2020) 77:891–2. doi: 10.1001/jamapsychiatry.2020.0894
3. Torales J, O'Higgins M, Castaldelli-Maia JM, Ventriglio A. The outbreak of COVID-19 coronavirus and its impact on global mental health. *Int J Soc Psychiatry.* (2020) 66:317–20. doi: 10.1177/0020764020915212
4. Ammar A, Brach M, Trabelsi K, Chtourou H, Boukhris O, Masmoudi L, et al. Effects of COVID-19 home confinement on eating behaviour and physical activity: results of the ECLB-COVID19 International Online Survey. *Nutrients.* (2020) 12:1583. doi: 10.3390/nu12061583
5. Burhamah W, AlKhayyat A, Oroszlanyova M, AlKenane A, Almansouri A, Behbehani M, et al. The psychological burden of the COVID-19 pandemic and associated lockdown measures: experience from 4000 participants. *J Affect Disord.* (2020) 277:977–85. doi: 10.1016/j.jad.2020.09.014
6. Mazza C, Ricci E, Biondi S, Colasanti M, Ferracuti S, Napoli C, et al. A nationwide survey of psychological distress among Italian people during the COVID-19 pandemic: immediate psychological responses and associated factors. *Int J Environ Res Public Health.* (2020) 17:3165. doi: 10.3390/ijerph17093165
7. Lei L, Huang X, Zhang S, Yang J, Yang L, Xu M. Comparison of prevalence and associated factors of anxiety and depression among people affected by versus people unaffected by quarantine during the COVID-19 epidemic in Southwestern China. *Med Sci Monit.* (2020) 26:e924609. doi: 10.12659/MSM.924609
8. Whitehead BR, Torossian E. Older adults' experience of the COVID-19 pandemic: a mixed-methods analysis of stresses and joys. *Gerontologist.* (2020) 61:36–47. doi: 10.1093/geront/gnaa126

9. Yang Y, Li W, Zhang Q, Zhang L, Cheung T, Xiang YT. Mental health services for older adults in China during the COVID-19 outbreak. *Lancet Psychiatry.* (2020) 7:e19. doi: 10.1016/S2215-0366(20)30079-1
10. Liu JJ, Bao Y, Huang X, Shi J, Lu L. Mental health considerations for children quarantined because of COVID-19. *Lancet Child Adolesc Health.* (2020) 4:347–9. doi: 10.1016/S2352-4642(20)30096-1
11. Cluver L, Lachman JM, Sherr L, Wessels I, Krug E, Rakotomalala S, et al. Parenting in a time of COVID-19. *Lancet Infect Dis.* (2020) 11:e64. doi: 10.1016/S0140-6736(20)30736-4
12. Courtney D, Watson P, Battaglia M, Mulsant BH, Szatmari P. COVID-19 impacts on child and youth anxiety and depression: challenges and opportunities. *Can J Psychiatry.* (2020) 65:688–91. doi: 10.1177/0706743720935646
13. Commodari E, La Rosa VL. Adolescents in quarantine during COVID-19 pandemic in italy: perceived health risk, beliefs, psychological experiences and expectations for the future. *Front Psychol.* (2020) 11:559951. doi: 10.3389/fpsyg.2020.559951
14. Wang C, Zhao H. The impact of COVID-19 on anxiety in Chinese University Students. *Front Psychol.* (2020) 11:1168. doi: 10.3389/fpsyg.2020.01168
15. Bivia-Roig G, La Rosa VL, Gomez-Tebar M, Serrano-Raya L, Amer-Cuenca JJ, Caruso S, et al. Analysis of the impact of the confinement resulting from COVID-19 on the lifestyle and psychological wellbeing of Spanish pregnant women: an internet-based cross-sectional survey. *Int J Environ Res Public Health.* (2020) 17:5933. doi: 10.3390/ijerph17165933
16. Cullen W, Gulati G, Kelly BD. Mental health in the COVID-19 pandemic. *QJM.* (2020) 113:311–2. doi: 10.1093/qjmed/hcaa110
17. Zhang K, Zhou X, Liu H, Hashimoto K. Treatment concerns for psychiatric symptoms in patients with COVID-19 with or without psychiatric disorders. *Br J Psychiatry.* (2020) 217:351. doi: 10.1192/bjp.2020.84
18. Yao H, Chen JH, Xu YF. Patients with mental health disorders in the COVID-19 epidemic. *Lancet Psychiatry.* (2020) 7:e21. doi: 10.1016/S2215-0366(20)30090-0

19. Lee SW, Yang JM, Moon SY, Yoo IK, Ha EK, Kim SY, et al. Association between mental illness and COVID-19 susceptibility and clinical outcomes in South Korea: a nationwide cohort study. *Lancet Psychiatry.* (2020) 7:1025–31. doi: 10.1016/S2215-0366(20)30421-1

20. Costa M, Pavlo A, Reis G, Ponte K, Davidson L. COVID-19 concerns among persons with mental illness. *Psychiatr Serv.* (2020) 71:1188–90. doi: 10.1176/appi.ps.202000245

21. Rodriguez LM, Litt DM, Stewart SH. Drinking to cope with the pandemic: the unique associations of COVID-19-related perceived threat and psychological distress to drinking behaviors in American men and women. *Addict Behav.* (2020) 110:106532. doi: 10.1016/j.addbeh.2020.106532

22. Higuchi S, Mihara S, Kitayuguchi T, Miyakoshi H, Ooi M, Maezono M, et al. Prolonged use of internet and gaming among treatment seekers arising out of social restrictions related to COVID-19 pandemic. *Psychiatry Clin Neurosci.* (2020) 74:607–8. doi: 10.1111/pcn.13127

23. La Rosa VL, Gori A, Faraci P, Vicario CM, Craparo G. Traumatic distress, alexithymia, dissociation, and risk of addiction during the first wave of COVID-19 in Italy: results from a cross-sectional online survey on a non-clinical adult sample. *Int J Ment Health Addict.* (2021) 1–17. doi: 10.1007/s11469-021-00569-0

24. Wu P, Liu X, Fang Y, Fan B, Fuller CJ, Guan Z, et al. Alcohol abuse/dependence symptoms among hospital employees exposed to a SARS outbreak. *Alcohol Alcohol.* (2008) 43:706–12. doi: 10.1093/alcalc/agn073

25. Eitan S, Emery MA, Bates MLS, Horrax C. Opioid addiction: Who are your real friends? *Neurosci Biobehav Rev.* (2017) 83:697–712. doi: 10.1016/j.neubiorev.2017.05.017

26. Sinha R. Chronic stress, drug use, and vulnerability to addiction. *Ann N Y Acad Sci.* (2008) 1141:105–30. doi: 10.1196/annals.1441.030

27. Kim JU, Majid A, Judge R, Crook P, Nathwani R, Selvapatt N, et al. Effect of COVID-19 lockdown on alcohol consumption in patients with pre-existing alcohol use disorder. *Lancet Gastroenterol Hepatol.* (2020) 5:886–7. doi: 10.1016/S2468-1253(20)30251-X

28. Ataiants J, Roth AM, Mazzella S, Lankenau SE. Circumstances of overdose among street-involved, opioid-injecting women: drug, set, and setting. *Int J Drug Policy.* (2020) 78:102691. doi: 10.1016/j.drugpo.2020.102691

29. Baillargeon J, Polychronopoulou E, Kuo YF, Raji MA. The impact of substance use disorder on COVID-19 outcomes. *Psychiatr Serv.* (2020):appips202000534. doi: 10.1176/appi.ps.202000534

30. Wang QQ, Kaelber DC, Xu R, Volkow ND. COVID-19 risk and outcomes in patients with substance use disorders: analyses from electronic health records in the United States. *Mol Psychiatry.* (2020) 26: 30–9. doi: 10.1038/s41380-020-00880-7

31. Schimmel J, Manini AF. Opioid use disorder and COVID-19: biological plausibility for worsened outcomes. *Subst Use Misuse.* (2020) 55:1900–1. doi: 10.1080/10826084.2020.1791184

32. Marsden J, Darke S, Hall W, Hickman M, Holmes J, Humphreys K, et al. Mitigating and learning from the impact of COVID-19 infection on addictive disorders. *Addiction.* (2020) 115:1007–10. doi: 10.1111/add.15080

33. Kontoangelos K, Economou M, Papageorgiou C. Mental health effects of COVID-19 pandemia: a review of clinical and psychological traits. *Psychiatry Investig.* (2020) 17:491–505. doi: 10.30773/pi.2020.0161

34. Lazarus RS, Kanner AD, Folkman S. Emotions: a cognitive phenomenological analysis. *Theor Emotion.* (1980) 189–217. doi: 10.1016/B978-0-12-558701-3.50014-4

35. Folkman S, Moskowitz JT. Positive affect and the other side of coping. *Am Psychol.* (2000) 55:647–54. doi: 10.1037/0003-066X.55.6.647

36. Fredrickson BL, Levenson RW. Positive emotions speed recovery from the cardiovascular sequelae of negative emotions. *Cogn Emot.* (1998) 12:191–220. doi: 10.1080/026999398379718

37. Gross JJ, Muñoz RF. Emotion regulation and mental health. *Clin Psychol Sci Pract.* (1995) 2:151–64. doi: 10.1111/j.1468-2850.1995.tb00036.x

38. Quirin M, Bode RC, Kuhl J. Recovering from negative events by boosting implicit positive affect. *Cogn Emot.* (2011) 25:559–70. doi: 10.1080/02699931.2010.536418

39. Fulton C. The pleasure principle: the power of positive affect in information seeking. *Aslib Proc.* (2009) 61:245–61. doi: 10.1108/00012530910959808

40. Aspinwall LG. Rethinking the role of positive affect in self-regulation. *Motiv Emot.* (1998) 22:1–32. doi: 10.1023/A:1023080224401

41. Isen AM. An influence of positive affect on decision making in complex situations: theoretical issues with practical implications. *J Consum Psychol.* (2001) 11:75–85. doi: 10.1207/S15327663JCP1102_01

42. Steptoe A, O'Donnell K, Marmot M, Wardle J. Positive affect and psychosocial processes related to health. *Br J Psychol.* (2008) 99:211–27. doi: 10.1111/j.2044-8295.2008.tb00474.x

43. Pressman SD, Jenkins BN, Moskowitz JT. Positive affect and health: what do we know and where next should we go? *Annu Rev Psychol.* (2019) 70:627–50. doi: 10.1146/annurev-psych-010418-102955

44. Alves JM, Yunker AG, DeFendis A, Xiang AH, Page KA. BMI status and associations between affect, physical activity and anxiety among U.S. children during COVID-19. *Pediatr Obes.* (2020) 16:e12786. doi: 10.1111/ijpo.12786

45. Wills TA, Vaccaro D, McNamara G. The role of life events, family support, and competence in adolescent substance use: a test of vulnerability and protective factors. *Am J Community Psychol.* (1992) 20:349–74. doi: 10.1007/BF00937914

46. Stasiewicz PR, Maisto SA. Two-factor avoidance theory: The role of negative affect in the maintenance of substance use and substance use disorder. *Behav Ther.* (1993) 24:337–56. doi: 10.1016/S0005-7894(05)80210-2

47. Serafini K, Malin-Mayor B, Nich C, Hunkele K, Carroll KM. Psychometric properties of the Positive and Negative Affect Schedule (PANAS) in a heterogeneous sample of substance users. *Am J Drug Alcohol Abuse.* (2016) 42:203–12. doi: 10.3109/00952990.2015.1133632

48. Peckham AD, McHugh RK, Kneeland ET, Björgvinsson T, Beard C. Dampening of positive affect predicts substance use during partial hospitalization. *Cognit Ther Res.* (2020) 44:811–9. doi: 10.1007/s10608-020-10101-8

49. Yang C, Xia M, Zhou Y. How is perceived social support linked to life satisfaction for individuals with substance-use disorders? The mediating role of resilience and positive affect. *Curr Psychol.* (2020) 18:1–4. doi: 10.1007/s12144-020-00783-4

50. Martinotti G, Alessi MC, Di Natale C, Sociali A, Ceci F, Lucidi L, et al. Psychopathological burden and quality of life in substance users during the COVID-19 lockdown period in Italy. *Front Psychiatry.* (2020) 11:572245. doi: 10.3389/fpsyt.2020.572245

51. Aldwin C. *Stress, Coping, and Development.* New York: Guilford Press. (1994).

52. Tedlie Moskowitz J, Folkman S, Collette L, Vittinghoff E. Coping and mood during aids-related caregiving and bereavement. *Ann Behav Med.* (1996) 18:49–57. doi: 10.1007/BF02903939

53. Galiana L, Tomas JM, Fernandez I, Oliver A. Predicting well-being among the elderly: the role of coping strategies. *Front Psychol.* (2020) 11:616. doi: 10.3389/fpsyg.2020.00616

54. Dawson DL, Golijani-Moghaddam N. COVID-19: psychological flexibility, coping, mental health, and wellbeing in the UK during the pandemic. *J Contextual Behav Sci.* (2020) 17:126–34. doi: 10.1016/j.jcbs.2020.07.010

55. Petzold MB, Plag J, Strohle A. Dealing with psychological distress by healthcare professionals during the COVID-19 pandemia. *Nervenarzt.* (2020) 91:417–21. doi: 10.1007/s00115-020-00905-0

56. Huang L, Lei W, Xu F, Liu H, Yu L. Emotional responses and coping strategies in nurses and nursing students during Covid-19 outbreak: a comparative study. *PLoS ONE.* (2020) 15:e0237303. doi: 10.1371/journal.pone.0237303

57. UNODC. *World Drug Report 2021.* (2021). Retrieved from: https://www.unodc.org/res/wdr2021/field/WDR21_Booklet_2.pdf

58. Yang M, Liao Y, Wang Q, Chawarski MC, Hao W. Profiles of psychiatric disorders among heroin dependent individuals in Changsha, China. *Drug Alcohol Depend.* (2015) 149:272–9. doi: 10.1016/j.drugalcdep.2015.01.028

59. Dong H, Yang M, Liu L, Zhang C, Liu M, Shen Y, et al. Comparison of demographic characteristics and psychiatric comorbidity among methamphetamine-, heroin- and methamphetamine-heroin co-dependent males in Hunan, China. *BMC Psychiatry.* (2017) 17:183. doi: 10.1186/s12888-017-1346-7

60. Wang Z, Li WX, Zhi-Min L. Similarity and difference in drug addiction process between heroin- and methamphetamine-dependent users. *Subst Use Misuse.* (2017) 52:459–67. doi: 10.1080/10826084.2016.1245331

61. Pierucci-Lagha A, Gelernter J, Feinn R, Cubells JF, Pearson D, Pollastri A, et al. Diagnostic reliability of the Semi-structured Assessment for Drug

Dependence and Alcoholism (SSADDA). *Drug Alcohol Depend.* (2005) 80:303–12. doi: 10.1016/j.drugalcdep.2005.04.005

62. Pierucci-Lagha A, Gelernter J, Chan G, Arias A, Cubells JF, Farrer L, et al. Reliability of DSM-IV diagnostic criteria using the semi-structured assessment for drug dependence and alcoholism (SSADDA). *Drug Alcohol Depend.* (2007) 91:85–90. doi: 10.1016/j.drugalcdep.2007.04.014

63. Malison RT, Kalayasiri R, Sanichwankul K, Sughondhabirom A, Mutirangura A, Pittman B, et al. Inter-rater reliability and concurrent validity of DSM-IV opioid dependence in a Hmong isolate using the Thai version of the Semi-Structured Assessment for Drug Dependence and Alcoholism (SSADDA). *Addict Behav.* (2011) 36:156–60. doi: 10.1016/j.addbeh.2010.08.031

64. Quinn AE, Rosen RK, McGeary JE, Amoa F, Kranzler HR, Francazio S, et al. Translating the semi-structured assessment for drug dependence and alcoholism in the Western Pacific: rationale, study design and reliability of alcohol dependence. *Alcohol Alcohol.* (2014) 49:525–30. doi: 10.1093/alcalc/agu035

65. Ma Y-J, Wang Y-Y, Meng-QiLiu, Fang T, Wei Z-R, Chen S-B, et al. Reliability and validity of DSM-IV and DSM-5 methamphetamine use disorder diagnoses using the Chinese Version of the Semi-Structured Assessment for Drug Dependence and Alcoholism (SSADDA). *Drug Alcohol Depend.* (2021) In Press. doi: 10.1016/j.drugalcdep.2021.109047

66. Denis CM, Gelernter J, Hart AB, Kranzler HR. Inter-observer reliability of DSM-5 substance use disorders. *Drug Alcohol Depend.* (2015) 153:229–35. doi: 10.1016/j.drugalcdep.2015.05.019

67. Kalayasiri R, Gelernter J, Farrer L, Weiss R, Brady K, Gueorguieva R, et al. Adolescent cannabis use increases risk for cocaine-induced paranoia. *Drug Alcohol Depend.* (2010) 107:196–201. doi: 10.1016/j.drugalcdep.2009.10.006

68. Umar MU, Salihu AS, Owolabi SD. Prevalence and correlates of ADHD in individuals with substance use disorder in Nigeria. *Atten Defic Hyperact Disord.* (2017) 9:189–98. doi: 10.1007/s12402-017-0218-9

69. Jensen KP, Kranzler HR, Stein MB, Gelernter J. The effects of a MAP2K5 microRNA target site SNP on risk for anxiety and depressive disorders. *Am J Med Genet B Neuropsychiatr Genet.* (2014) 165B:175–83. doi: 10.1002/ajmg.b.32219

70. Feinn R, Gelernter J, Cubells JF, Farrer L, Kranzler HR. Sources of unreliability in the diagnosis of substance dependence. *J Stud Alcohol Drugs.* (2009) 70:475–81. doi: 10.15288/jsad.2009.70.475

71. Schmitz JM, Green CE, Hasan KM, Vincent J, Suchting R, Weaver MF, et al. PPAR-gamma agonist pioglitazone modifies craving intensity and brain white matter integrity in patients with primary cocaine use disorder: a double-blind randomized controlled pilot trial. *Addiction.* (2017) 112:1861–8. doi: 10.1111/add.13868

72. Lundahl LH, Greenwald MK. Magnitude and duration of cue-induced craving for marijuana in volunteers with cannabis use disorder. *Drug Alcohol Depend.* (2016) 166:143–9. doi: 10.1016/j.drugalcdep.2016.07.004

73. Huang L, Yang TZ. Ji MZ. Applicability of the positive and negative affect scale in Chinese. *Chin Mental Health J.* (2003) 17:54–6.

74. Yao D, Lyu J, Ma Z, Champ M, Xiong Q, Li M, et al. Influencing factors of psychological well-being of the non-designated hospital staff in china during the COVID-19 pandemic. *Front Psychiatry.* (2021) 12:591026. doi: 10.3389/fpsyt.2021.591026

75. Cai Z, Zheng S, Huang Y, Zhang X, Qiu Z, Huang A, et al. Emotional and cognitive responses and behavioral coping of Chinese medical workers and general population during the pandemic of COVID-19. *Int J Environ Res Public Health.* (2020) 17:6198. doi: 10.3390/ijerph17176198

76. Watson D, Clark LA, Tellegen A. Development and validation of brief measures of positive and negative affect: the PANAS scales. *J Personal Soc Psychol.* (1988) 54:1063–70. doi: 10.1037/0022-3514.54.6.1063

77. Staak M, Rupp CP. Life expectancy of the drug addict. *Versicherungsmedizin.* (1993) 45:10–4.

78. Wang Q, Wang Y, Zuo J, Zhou Y, Yang WFZ, Liao Y, et al. Factors of negative affect in elderly patients with substance use disorders during COVID-19 pandemic. *Front Psychiatry.* (2021) 12:697472. doi: 10.3389/fpsyt.2021.697472

79. Siddiquea BN, Shetty A, Bhattacharya O, Afroz A, Billah B. Global epidemiology of COVID-19 knowledge, attitude and practice: a systematic review and meta-analysis. *BMJ Open.* (2021) 11:e051447. doi: 10.1136/bmjopen-2021-051447

80. Tang J, Liao Y, He H, Deng Q, Zhang G, Qi C, et al. Sleeping problems in Chinese illicit drug dependent subjects. *BMC Psychiatry.* (2015) 15:28. doi: 10.1186/s12888-015-0409-x

81. Wang Y, Zuo J, Hao W, Shen H, Zhang X, Deng Q, et al. Quality of life in patients with methamphetamine use disorder: relationship to impulsivity and drug use characteristics. *Front Psychiatry.* (2020) 11:579302. doi: 10.3389/fpsyt.2020.579302

82. Friedmann PD, Lemon SC, Anderson BJ, Stein MD, Drug Abuse Treatment Outcome Study. Predictors of follow-up health status in the Drug Abuse Treatment Outcome Study (DATOS). *Drug Alcohol Depend.* (2003) 69:243–51. doi: 10.1016/S0376-8716(02)00323-X

83. Palamar JJ, Le A, Carr TH, Cottler LB. Shifts in drug seizures in the United States during the COVID-19 pandemic. *Drug Alcohol Depend.* (2021) 221:108580. doi: 10.1016/j.drugalcdep.2021.108580

84. Chen J, Zhang M, Zhou J, Li X, Zhang F, Shen M. Implicit and explicit self-identification as a drug user in people who used heroin and methamphetamine. *Front Psychol.* (2021) 12:685110. doi: 10.3389/fpsyg.2021.685110

85. Sayette MA. The role of craving in substance use disorders: theoretical and methodological issues. *Annu Rev Clin Psychol.* (2016) 12:407–33. doi: 10.1146/annurev-clinpsy-021815-093351

86. Lomranz J, Bergman S, Eyal N, Shmotkin D. Indoor and outdoor activities of aged women and men as related to depression and well-being. *Int J Aging Hum Dev.* (1988) 26:303–14. doi: 10.2190/QPEW-N6QX-FWDE-LA7E

87. Sekaran NK, Choi H, Hayward RA, Langa KM. Fall-associated difficulty with activities of daily living in functionally independent individuals aged 65 to 69 in the United States: a cohort study. *J Am Geriatr Soc.* (2013) 61:96–100. doi: 10.1111/jgs.12071

88. Hilleras PK, Jorm AF, Herlitz A, Winblad B. Activity patterns in very old people: a survey of cognitively intact subjects aged 90 years or older. *Age Ageing.* (1999) 28:147–52. doi: 10.1093/ageing/28.2.147

89. Lin YH, McLain AC, Probst JC, Bennett KJ, Qureshi ZP, Eberth JM. Health-related quality of life among adults 65 years and older in the United States, 2011–2012: a multilevel small area estimation approach. *Ann Epidemiol.* (2017) 27:52–8. doi: 10.1016/j.annepidem.2016.09.016

90. Agli O, Bailly N, Ferrand C. Validation of the Functional Assessment of Chronic Illness Therapy-Spiritual Well-being (FACIT-Sp12) on French old people. *J Relig Health.* (2017) 56:464–76. doi: 10.1007/s10943-016-0220-0

91. Garland EL, Bryan CJ, Nakamura Y, Froeliger B, Howard MO. Deficits in autonomic indices of emotion regulation and reward processing associated with prescription opioid use and misuse. *Psychopharmacology.* (2017) 234:621–9. doi: 10.1007/s00213-016-4494-4

92. Schweiger D, Stemmler G, Burgdorf C, Wacker J. Opioid receptor blockade and warmth-liking: effects on interpersonal trust and frontal asymmetry. *Soc Cogn Affect Neurosci.* (2014) 9:1608–15. doi: 10.1093/scan/nst152

93. Cordovil De Sousa Uva M, Luminet O, Cortesi M, Constant E, Derely M, De Timary P. Distinct effects of protracted withdrawal on affect, craving, selective attention and executive functions among alcohol-dependent patients. *Alcohol Alcohol.* (2010) 45:241–6. doi: 10.1093/alcalc/agq012

94. Minami H, Yeh VM, Bold KW, Chapman GB, McCarthy DE. Relations among affect, abstinence motivation and confidence, and daily smoking lapse risk. *Psychol Addict Behav.* (2014) 28:376–88. doi: 10.1037/a0034445

95. Carrico AW, Woods WJ, Siever MD, Discepola MV, Dilworth SE, Neilands TB, et al. Positive affect and processes of recovery among treatment-seeking methamphetamine users. *Drug Alcohol Depend.* (2013) 132:624–9. doi: 10.1016/j.drugalcdep.2013.04.018

96. Dang AK, Le XTT, Le HT, Tran BX, Do TTT, Phan HTB, et al. Evidence of COVID-19 impacts on occupations during the first vietnamese national lockdown. *Ann Glob Health.* (2020) 86:112. doi: 10.5334/aogh.2976

97. Farre L, Fawaz Y, Gonzalez L, Graves J. How the Covid-19 lockdown affected gender inequality in paid and unpaid work in Spain. *IZA Discussion Paper.* (2020) No. 13434.

98. Ben-Zur H. Coping, affect and aging_ the roles of mastery and self-esteem. *Pers Individ Dif.* (2002) 32:357–72. doi: 10.1016/S0191-8869(01)00031-9

99. Nezlek JB, Kuppens P. Regulating positive and negative emotions in daily life. *J Pers.* (2008) 76:561–80. doi: 10.1111/j.1467-6494.2008.00496.x

100. Bu F, Steptoe A, Fancourt D. Who is lonely in lockdown? Cross-cohort analyses of predictors of loneliness before and during the COVID-19 pandemic. *Public Health.* (2020) 186:31–4. doi: 10.1016/j.puhe.2020.06.036

101. Shankar A. Loneliness and sleep in older adults. *Soc Psychiatry Psychiatr Epidemiol.* (2020) 55:269–72. doi: 10.1007/s00127-019-01805-8

102. Leigh-Hunt N, Bagguley D, Bash K, Turner V, Turnbull S, Valtorta N, et al. An overview of systematic reviews on the public health consequences of social isolation and loneliness. *Public Health.* (2017) 152:157–71. doi: 10.1016/j.puhe.2017.07.035

103. Dunton GF, Do B, Wang SD. Early effects of the COVID-19 pandemic on physical activity and sedentary behavior in children living in the US. *BMC Public Health.* (2020) 20:1351. doi: 10.1186/s12889-020-09429-3

104. Castaneda-Babarro A, Arbillaga-Etxarri A, Gutierrez-Santamaria B, Coca A. Physical activity change during COVID-19 confinement. *Int J Environ Res Public Health.* (2020) 17:6878. doi: 10.3390/ijerph17186878

105. von Elm E, Altman DG, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Lancet.* (2007) 370:1453–7. doi: 10.1016/S0140-6736(07)61602-X