The development and validation of the pandemic medication-assisted treatment questionnaire for the assessment of the impact of pandemic crises on medication management and administration for patients with opioid use disorders

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Abstract

COVID-19 pandemic and the globally applied restriction measures mainly affect vulnerable population groups, such as patients with opioid use disorders. Towards inhibiting SARS-COV-2 spread, the medication-assisted treatment (MAT) programs follow strategies targeting reduction of in-person psychosocial interventions, and increase of take-home doses. However, there is no available instrument to examine the impact of such modifications on diverse health aspects of patients under MAT. The aim of this study was to develop and validate the PANdemic Medication-Assisted Treatment Questionnaire (PANMAT/Q) to address the pandemic effect on the management and administration of MAT. In total, 463 patients under MAT participated. Our findings indicate that PANMAT/Q has been successfully validated exerting reliability and validity. It can be completed within approximately 5 minutes, and its implementation in research settings is advocated. PANMAT/Q could serve as a useful tool to identify the needs of patients under MAT being in high risk for relapse and overdose.

Introduction

Patients with opioids use disorders (OUDs) constitute a highly vulnerable population group. Indeed, the restriction and social distancing measures adopted by societies to decelerate COVID-19 pandemic significantly affect their lives through intensifying medical and psychiatric co-morbidity (Volkow, 2020; Williams et al., 2021). This global public health crisis has induced serious changes in the implemented programs of medication-assisted treatment (MAT), since it led to crucial modifications in the delivery of medical care and in the regimen (i.e., management and administration) of medication for opioid use disorders (MOUD) (Chan et al., 2022; Treitler et al., 2022). In particular, there has been observed a trend by the OUDs patients to offer and buy illicit substances from black market (Baillargeon et al., 2021), thus altering the management of MOUD with craving and misuse being the most serious outcomes (Lambert, 2020). Moreover, economic and health disparities, inadequacy of supportive environment, homelessness, imprisonment, psychological trauma, stigma, and barriers that impede access to treatment due to restrictive measures have resulted in the adoption of unsafe practices that disturb management and administration of MOUD (Vasylyeva et al., 2020). Consequently, relapse to opioids and further impairment of the already problematic quality of life of OUDs patients have been observed, however reliable tools for the assessment of such situations under extreme periods, such as the COVID-19 pandemic crisis are lacking (Leventelis et al., 2020a; Tyndall, 2020).

Several uni-and multidimensional scales and tools have been developed to describe and assess specific problems on the procedure of substance use, such as the desire for using, the disorders due to use or the severity of health problems contributed to substance use (Marsden et al., 1998; McLellan et al., 1992; Tiffany et al., 1993). However, in most of the cases, the existing tools fail to include in their evaluation all potential dimensions of human behavior (Terwee et al., 2007). Regarding the impact of the pandemic on mental health, diverse tools have been developed for the assessment of psychological destruction (Akan, 2022), fear (de Almeida et al., 2020), anxiety (Chandu et al., 2020), preventive behaviors (Chang et al., 2022), the impact of event (Vanaken et al., 2020) and the quality of life (Repišti et al., 2020). Referring to patients with OUDs under MAT, most of the available studies have been focused mainly on the description of the emotional states of the patients affected by COVID-19, creating tools for the detection of worries or fear (i.e., the COVID-19 Worry

Index and the Fear of COVID-19 scale), or to assess the forces that promote motivation to substance use (Rogers et al., 2020). Other tools have been built to measure COVID-19-related anxiety and depression (Adinolfi et al., 2021), as well as symptoms of anxiety and depressive disorders, suicidal attitude and substance use disorders due to COVID-19 (Czeisler et al., 2020).

However, the need for the development of a questionnaire that will consider the alterations in the MAT programs dictated by the pandemic through the incorporation of the appropriate and accurate questions is indisputable. The above-mentioned alterations were implemented under the concept that spread of COVID-19 should be prevented also in MAT programs to protect the members of the vulnerable population that attend them. Towards this direction, specific adjustments in the MAT administration procedures were made. The most important of them were the confinement of the daily face to face visits of the patients to the MAT programs to take their medication, the enhancement of the number of the take-home doses (i.e., 15 or 30 take-home doses, thus the patients visit the MAT programs only once or twice a month), the reduction of the frequency of drug urine screening for toxic substances and the constraint of the services that offer psychosocial support to the patients (Corace et al., 2022; Del Pozo & Rich, 2020; Harris et al., 2022; Nunes et al., 2021).

All these changes may negatively affect the procedure of successful maintenance treatment, thus preventing rehab via increase of craving. Interestingly, methadone and buprenorphine, along with counseling and psychosocial services offered by MAT programs, aim to the high adherence of patients to treatment. In parallel, this MAT practice intends to reduce illegal substance use and overdose mortality rates, as well as to inhibit aggressive and drug-seeking behaviors (Joseph et al., 2021; Treitler et al., 2022). Notwithstanding, because of the loosening of the regulations on MOUD attributed to COVID-19 measures, concerns regarding the diversion of opioids into the black market and the potential surge of harmful health consequences from misuse and overdose of prescribed medications have emerged (Del Pozo & Rich, 2020; Nagelhout et al., 2017; Nunes et al., 2021). To our knowledge, there is no available tool regarding the assessment of the impact of COVID-19 pandemic on the management and administration of MOUD and on several health and social parameters that pertain to MAT patients as evaluated by the patients themselves (Harris et al., 2022). This is an important matter, since examined from the patient perspective, a major context for the observed impact of the pandemic-related changes on mental and clinical parameters could guide research and public health policies to address specific issues as they have been stressed by the patients themselves (Harris et al., 2022). In that end, the main objective of the present study was the development and validation of the PANdemic Medication-Assisted Treatment Questionnaire, i.e., PANMAT/Q, an instrument for the management and administration of MOUD, namely methadone and buprenorphine, in patients under MAT programs. It is expected that such a questionnaire, which is oriented toward patients under MOUD, will offer valuable insight concerning the impact of restriction measures applied globally in the COVID-19 era, as well as in similar crises that will potentially arise in the future, on the trajectory to retention to maintenance treatment and, finally, rehab and social reintegration.

Material And Methods

The development of the questionnaire

Conceptual framework. After the onset of COVID-19 pandemic, the Greek Organization against Drugs (OKANA) and other relevant authorities worldwide provided their patients with their take-home doses for an extended period up to a whole month. The concept for this action was to prevent the patients from visiting them every day, thus preventing the coronavirus spread. In compliance with a period of crisis, the Substance Abuse and Human Services Administration (SAMHSA) emphasized on the maintenance of the adherence of MOUD and encouraged providers to communicate two ideas to encourage the success of this modified way to offer medication to patients (Del Pozo & Rich, 2020). The first idea was that methadone and buprenorphine, as agonists MOUD, are a highly integral part of the therapeutic treatment of OUDs (Del Pozo & Rich, 2020). The second idea referred to the fact that access to treatment, even under this regimen, ensures high adherence and protection of the patients against overdose, whereas, although the danger for MOUD diversion and misuse is existent, it is considered less crucial (Del Pozo & Rich, 2020). To that end, the MAT programs were rapidly adapted in the new reality, regarding both the procedures of medication administration and psychosocial support. Nevertheless, enhancement of medication diversion, misuse and overdose were often noted, highlighting serious issues emerged about the MOUD management and retention to treatment due to COVID-19 pandemic (Corace et al., 2022; Del Pozo & Rich, 2020; Harris et al., 2022; Nunes et al., 2021).

Item generation. The main query of this study was to develop a questionnaire that will offer to professionals the ability to evaluate the management and administration of MOUD, namely methadone and buprenorphine, in patients under MAT programs during a period of public health crisis, that is the COVID-19 pandemic. On the basis of the theoretical background and the referred concerns, thirty-five (35) items concerning mood, substance administration, pandemic measures, sociability, accessibility to therapeutic programs, biopsychosocial support and wellness were created from scratch and were initially proposed. The chosen type of measurement was a 5-point Likert scale ranging from 1 (i.e., not at all) to 5 (i.e., very much). According to the literature, a five, seven or ten-point Likert scale allows the respondents to adequately express their feelings in a more sensitive manner compared to a scale with two, three or four response options (Preston & Colman, 2000).

Content validity. For the validation of the proposed PANMAT/Q, 10 expert scientists in the fields of addiction, psychiatry, nursing, psychology, and questionnaire development evaluated whether the introduced 35 items with a four-point Likert scale could lead to the desired outcome. After three rounds, 26 items with a content validity index (CVI) > 0.9 were selected. A CVI ≥ 0.8 is considered acceptable (Zamanzadeh et al., 2015). The readability of the questionnaire was reviewed by a Greek linguist. Then, 20 patients were invited to assess the language clarity and readability of the items and to identify potential difficulties with questionnaire completion.

Convergent validity. To assess convergent validity, PANMAT/Q was correlated with the Nottingham Health Profile (NHP) and the Heroin Craving Questionnaire (HCQ). The NHP is a self-administered tool and has been used to evaluate the impact of COVID-19 pandemic on the quality of life (QoL) of patients under MAT. It evaluates the discomfort of an individual that suffers from various health problems and their effects on his everyday activities. The validity and reliability of the Greek version was high with test-retest reliability coefficients, Spearman's r-value ranging between 0.77 and 0.86 (Leventelis et al., 2020a). The HCQ is a multidimensional self-administered instrument and has been used to measure craving of opioid-addicted

patients during the COVID-19 pandemic. The reliability of HCQ is high as indicated by the value of Cronbach's α = 0.9 (Leventelis et al., 2020b)

PANMAT/Q Validation

Participants and procedure. Based on the literature, the appropriate number of participants is recommended to be equal to 10 times the number of the items of the questionnaire (DeVellis, 2017). In our case, 260 participants are an adequate population. For the needs of the study, considering a percentage of dropout (usually 10%), 550 patients participated in 54 MAT programs of OKANA received the questionnaire. A total of 463 questionnaires were returned and used for the analysis. All patients were completely informed about the purpose and objectives of the experiment. The confidentiality of personal data was fully ensured, whereas each patient signed a consensus form before participating in the study. According to the inclusion criteria, the patients should be over 20 years of age, they should be long-term users of opioid substances suffering from physical and mental dependence, and they should be active members in MAT programs during at least two quarantine periods during the COVID-19 pandemic. Patients with severe psychopathology and serious pathological problems, which impaired attending the program, were excluded from the study. All patients completed the three above-mentioned instruments, i.e., PANMAT/Q, HCP and NHP, to assess the effects of pandemic on management and administration of MOUD, on craving and on their QoL.

MAT administration. The patients were under either methadone hydrochloride solution (10 mg/ml) or buprenorphine tablets (2–8 mg). Mean doses of methadone and buprenorphine were equal to 72.15 mg/24 h and 15.6 mg/24 h, respectively. According to the literature, daily doses of methadone between 40 mg − 100 mg and buprenorphine between 12 mg − 14 mg are considered effective (Saxon et al., 2013).

Ethical considerations

This study was performed in line with the European Union guidelines under the 1975 Helsinki Declaration as revised in 2013 and was approved by the Nursing Department of the University of Peloponnese, Tripoli, Greece and the scientific committee of OKANA.

Statistical analysis

Quantitative variables were expressed as mean values ± standard deviation (SD), and qualitative variables were expressed as absolute and relative frequencies. Exploratory factor analysis was carried out to evaluate construct validity, disclose underlying structures and reduce the number of variables in the impact of PANMAT/Q. Principal component analysis (PCA) was chosen as extraction method using Varimax rotation. Kaiser-Meyer-Olkin procedure for measuring sample adequacy was applied. The cut-off point for factor loadings was 0.40 and for eigenvalues it was 1.00. Internal consistency reliability was determined by the calculation of Cronbach's α coefficient. Scales with reliabilities equal to or greater than 0.70 were considered acceptable. Convergent validity was assessed with the association of PANMAT/Q impact factors with NHP and HCQ subscales via Pearson's correlational analysis (r). Discriminant construct validity was evaluated by comparing COVID-19 impact questionnaire factors between the two substitutes using Student's t-test. All reported p values are two-tailed. Statistical significance was set at $p < 0.05$ and analyses were conducted using SPSS statistical software (version 22.0)

Results

In total, 463 heroin addicts (76.8% males), whose characteristics are presented in Table 1, voluntarily participated in this study. Their mean age was 44.8 years, their nationality was almost exclusively (97.4%) Greek, and most of them had health insurance (68.5%) and were not married (64.7%). Also, 41.6% of the participants were high school graduates and 63.8% were unemployed. Mean age at first use was 17.8 years and mean duration both in MAT programs and drug use was 7.5 and 16.8 years, respectively. Moreover, 1.5% of the participants had diagnosed positive to COVID-19, and 6% had been in touch with a COVID-19 case. Furthermore, 39.2% of the volunteers were living in a high-risk area for COVID-19, and 75.2% received buprenorphine as a substitute (24.8% were under methadone treatment).

Table 1
The characteristics of the participants.

	N (%)
Gender	
Women	107 (23.2)
Men	355 (76.8)
Age, mean (SD)	44.8 (15.9)
Educational status	
None	8 (1.8)
Primary school	57 (12.5)
Secondary school	126 (27.6)
High school	190 (41.6)
Technical school	52 (11.4)
University	20 (4.4)
MSc	4 (0.9)
Nationality	
Greek	447 (97.4)
Other	12 (2.6)
Insurance	313 (68.5)
Family status	
Married	73 (16)
Unmarried	295 (64.7)
Widowed	12 (2.6)
Divorced	56 (12.3)
Separated	20 (4.4)
Work status	
Full-time	98 (21.4)
Part-time	43 (9.4)
Temporarily out of work	25 (5.4)
Unemployed	293 (63.8)
City	

	N (%)
Athens	192 (41.9)
Thessaloniki	38 (8.3)
Other	228 (49.8)
Place of residence	
Urban	371 (81.9)
Rural	82 (18.1)
Chronic disease	
Diabetes	11 (2.4)
Neoplasmatic disease	5 (1.1)
Cardiovascular disease	18 (3.9)
COPD	29 (6.3)
Systematic disease	9 (2)
Other	127 (27.5)
None	262 (56.8)
COVID case	7 (1.5)
In touch with COVID case	27 (6)
Tested for COVID	107 (23.8)
Living with COVID case	10 (2.2)
Living in high-risk place	178 (39.2)
Travelled in high-risk place	23 (5.1)
Substitute	
Methadone	115 (24.8)
Buprenorphine	348 (75.2)
NHP	Mean (SD)
Energy level	37.8 (39.3)
Pain	15.8 (23.6)
Emotional Reaction	40.5 (32)
Sleep, mean	44 (31.6)
Social Isolation	36.8 (34.9)

	N (%)
Physical abilities	15.5 (21.6)
HCQ	Mean (SD)
Desire to use heroine	16.3 (10.3)
Intention and planning to use heroine	18 (11)
Anticipation of positive outcome	19.8 (11.1)
Anticipation of relief from withdrawal or dysphoria	26.3 (10.5)
Lack of control over use	26.5 (10.7)

The items of PANMAT/Q are described in detail in Table 2. Exploratory factor analysis was conducted with Varimax rotation, suggesting 6 factors, as presented in Table 3. KMO value was 0.54 and Bartlett's criterion was statistically significant ($p < 0.001$. All loadings were above 0.4, thus all items were included in a factor. All 6 factors combined explained 80.23% of the variance. Factor "Mood" included 3 items and explained 13.72% of the variance. Also, factor "Substance administration and pandemic measures" included 6 items and explained 16.55% of the variance. Factor "Sociability" included 5 items and explained 13.26% of the variance. Moreover, factor "Accessibility to therapeutic programs" included 3 items and explained 9.52% of the variance. Factor "Biopsychosocial support from therapeutic programs" included 6 items and explained 16.34% of the variance. Furthermore, factor "Wellness" included 3 items and explained 10.84% of the variance.

Table 2
The items of PANMAT/Q

		Not at all	A little	Moderate	Much	Very much
Item		N (%)	N (%)	N (%)	N (%)	N (%)
	Did pandemic and the social distancing measures implemented affect...					
1	Expressing problems regarding your health?	2 (0.4)	41 (8.9)	303 (65.4)	101 (21.8)	16 (3.5)
2	Your mood when leaving your house in order to go to the medication assisted treatment program?	2 (0.4)	41 (8.9)	322 (69.5)	80 (17.3)	18 (3.9)
3	Your access to healthcare in general?	2 (0.4)	41 (8.9)	322 (69.5)	82 (17.7)	16 (3.5)
4	Your activities outside the home?	2 (0.4)	81 (17.5)	208 (44.9)	139 (30)	33 (7.1)
5	Your prescription needs regarding additional legally medicines?	2 (0.4)	130 (28.1)	153 (33)	130 (28.1)	48 (10.4)
6	The availability of your medication-assisted substance?	30 (6.5)	150 (32.4)	92 (19.9)	125 (27)	66 (14.3)
7	The availability of health care services provision by the medication-assisted treatment program?	100 (21.6)	91 (19.7)	61 (13.2)	140 (30.2)	71 (15.3)
8	Your social activities?	101 (21.8)	111 (24)	74 (16)	111 (24)	66 (14.3)
9	Expressing problems regarding your medication-assisted substance?	62 (13.4)	119 (25.7)	70 (15.1)	72 (15.6)	140 (30.2)
10	Your access to your medication-assisted treatment program?	2 (0.4)	170 (36.7)	113 (24.4)	45 (9.7)	133 (28.7)
11	The concurrent supply of psychoactive substances?	2 (0.4)	98 (21.2)	181 (39.1)	69 (14.9)	113 (24.4)
12	The management of take-home doses, by modifying the amount of medication/substitute taken at home?	3 (0.6)	99 (21.4)	167 (36.1)	117 (25.3)	77 (16.6)
13	Tackling difficulties due to the multiple take-home?	59 (12.7)	84 (18.1)	125 (27)	193 (41.7)	2 (0.4)
14	Availability of psychosocial services by your medication assisted treatment program?	13 (2.8)	69 (14.9)	162 (35)	160 (34.6)	59 (12.7)
15	Your need to get additional psychosocial support by your medication assisted treatment program?	7 (1.5)	46 (9.9)	120 (25.9)	191 (41.3)	99 (21.4)

		Not at all	A little	Moderate	Much	Very much
16	Your need to get additional support regarding health issues by your medication assisted treatment program?	2 (0.4)	39 (8.4)	125 (27)	186 (40.2)	111 (24)
17	Finding protective equipment (e.g., masks, gloves, antiseptic solutions, thermometers) as a preventive measure?	2 (0.4)	94 (20.3)	81 (17.5)	191 (41.3)	95 (20.5)
18	The concurrent illegal use of psychoactive substances?	31 (6.7)	70 (15.1)	138 (29.8)	125 (27)	99 (21.4)
19	Your behavior regarding seeking your medication/substitute?	29 (6.3)	63 (13.6)	144 (31.1)	138 (29.8)	89 (19.2)
20	The duration of time you stayed at home during the day?	60 (13)	6 (1.3)	141 (30.5)	123 (26.6)	133 (28.7)
21	The modification of your daily activities?	2 (0.4)	47 (10.2)	169 (36.5)	145 (31.3)	100 (21.6)
22	The magnitude of drug (i.e., psychoactive substances) taking, thus you faced an overdose risk?	49 (10.6)	4 (0.9)	166 (35.9)	91 (19.7)	153 (33)
23	Your mental health?	2 (0.4)	49 (10.6)	95 (20.5)	110 (23.8)	207 (44.7)
24	Your physical health?	2 (0.4)	9 (1.9)	124 (26.8)	144 (31.1)	184 (39.7)
25	Your social interaction?	2 (0.4)	62 (13.4)	86 (18.6)	50 (10.8)	263 (56.8)
26	The way you have taken your medication-assisted substance?	2 (0.4)	62 (13.4)	62 (13.4)	29 (6.3)	308 (66.5)

Table 3
The results of the exploratory factor analysis with Varimax rotation and descriptive statistics of the factors emerged.

Item	Mood	Substance administration and pandemic measures	Sociability	Accessibility to therapeutic programs	Biopsychosocial support from therapeutic programs	Wellness
1	0.92					
2	0.95					
3	0.95					
4		0.57				
5		0.86				
6		0.76				
13		-0.55				
20		0.71				
21		0.65				
7			0.61			
8			0.79			
9			0.78			
25			0.79			
26			0.81			
10				0.68		
11				0.81		
12				0.77		
14					0.76	
15					0.91	
16					0.86	
17					0.67	
18					0.57	
19					0.56	
22						0.78
23						0.83
24						0.78

Item	Mood	Substance administration and pandemic measures	Sociability	Accessibility to therapeutic programs	Biopsychosocial support from therapeutic programs	Wellness
Variance explained (%)	13.72	16.55	13.26	9.52	16.34	10.84
Mean (SD)	3.16 (0.63)	3.30 (0.78)	3.48 (1.04)	3.36 (0.92)	3.56 (0.82)	3.91 (0.94)

Table 4
Corrected Item-Total Correlations and internal consistency reliability of the PANMAT/Q factors.

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
Mood			0.98
Item 1	0.93	1.00	
Item 2	0.97	0.96	
Item 3	0.98	0.96	
Substance administration and pandemic measures			0.83
Item 4	0.54	0.82	
Item 5	0.74	0.78	
Item 6	0.60	0.81	
Item 13	0.49	0.83	
Item 20	0.63	0.80	
Item 21	0.70	0.79	
Sociability			0.85
Item 7	0.64	0.83	
Item 8	0.83	0.77	
Item 9	0.62	0.84	
Item 25	0.60	0.84	
Item 26	0.65	0.83	
Accessibility to therapeutic programs			0.76
Item 10	0.63	0.64	
Item 11	0.73	0.51	
Item 12	0.44	0.83	
Biopsychosocial support from therapeutic programs			0.88
Item 14	0.51	0.88	
Item 15	0.75	0.85	
Item 16	0.81	0.84	
Item 17	0.77	0.84	

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
Item 18	0.68	0.86	
Item 19	0.62	0.87	
Wellness			0.86
Item 22	0.77	0.77	
Item 23	0.88	0.65	
Item 24	0.59	0.92	

Corrected item-total correlations and Cronbach's alpha, if an item was deleted per factor are presented in Table 4. All corrected item-total correlations were above 0.4. Internal consistency reliability was acceptable for all factors. More specifically, Cronbach's alpha was 0.98 for "Mood", 0.83 for "Substance administration and pandemic measures", 0.85 for "Sociability", 0.76 for "Accessibility to therapeutic programs", 0.88 for "Biopsychosocial support from therapeutic programs" and 0.86 for "Wellness".

Correlations of PANMAT/Q factors with NHP and HCQ factors are presented in Table 5. Only "Sociability" was positively correlated with "Energy level" of NHP and "Anticipation of relief from withdrawal or dysphoria" and" Lack of control over use" of HCQ. All other factors were not significantly associated with NHP and HCQ factors.

Table 5
Pearson's correlation coefficients of PANMAT/Q factors with NHP and HCQ factors.

		Mood	Substance administration and pandemic measures	Sociability	Accessibility to therapeutic programs	Biopsychosocial support from therapeutic programs	Wellness
Energy level	r	-0.01	.03	.11	-0.03	-0.01	0.03
	P	0.756	0.472	**0.016**	0.520	0.905	0.473
Pain	r	0.00	0.07	0.08	-0.06	-0.02	0.06
	P	0.991	0.135	0.074	0.202	0.713	0.237
Emotional Reaction	r	-0.03	0.03	0.08	0.00	0.03	-0.01
	P	0.531	0.551	0.088	0.927	0.525	0.832
Sleep	r	-0.04	0.02	0.07	0.02	0.01	-0.06
	P	0.368	0.697	0.158	0.676	0.868	0.206
Social Isolation	r	0.01	0.00	0.09	0.03	0.03	-0.03
	P	0.758	0.916	0.055	0.481	0.555	0.560
Physical abilities	r	0.03	0.02	0.09	-0.03	-0.04	-0.02
	P	0.467	0.715	0.065	0.560	0.372	0.741
Desire to use heroine	r	0.05	0.07	0.07	0.00	-0.02	0.00
	P	0.267	0.123	0.119	0.969	0.734	0.925
Intention and planning to use heroine	r	0.03	0.03	0.09	-0.03	-0.05	-0.02
	P	0.468	0.549	0.063	0.504	0.314	0.690
Anticipation of positive outcome	r	0.05	0.04	0.07	-0.01	0.00	-0.07
	P	0.260	0.374	0.124	0.883	0.923	0.120
Anticipation of relief from withdrawal or dysphoria	r	0.06	0.04	0.11	0.05	0.00	0.00
	P	0.183	0.401	**.018**	0.329	0.930	0.945
Lack of control over use	r	-0.03	0.03	.11	-0.04	0.01	-0.01
	P	0.543	0.538	**.022**	0.460	0.811	0.780

PANMAT/Q factors by MAT are presented in Table 6. Participants under methadone had significantly greater impact of COVID-19 in almost all sectors (except for "Accessibility to therapeutic programs") compared to their counterparts under buprenorphine.

Table 6
PANMAT/Q factors by substitute.

	Substitute				P Student's t-test
	Methadone		Buprenorphine		
	Mean	SD	Mean	SD	
Mood	3.44	0.70	3.07	0.58	< 0.001
Substance administration and pandemic measures	3.97	0.72	3.07	0.67	< 0.001
Sociability	4.09	0.69	3.28	1.06	< 0.001
Accesibility to therapeutic programs	3.41	0.83	3.34	0.95	0.441
Biopsychosocial support from therapeutic programs	3.77	0.81	3.49	0.81	0.001
Wellness	4.29	0.71	3.79	0.98	< 0.001

Discussion

The present study reports for the first time the development and validation of a psychometric instrument (i.e., PANMAT/Q) for the evaluation of pandemic impact on social and clinical parameters of patients under MAT with methadone and buprenorphine. PANMAT/Q is referred to patients themselves since it is completed by them and considers the modifications in the MOUD programs that are attributed to the restriction and social distancing measures applied in the context of COVID-19 pandemic. The questionnaire is a concise and friendly-to-user instrument, it can be filled in approximately 5 minutes, and it covers all major aspects and barriers that mediate in the management and administration of agonists against opioid use disorders in patients that attend MAT programs. According to the factor analysis, six factors are involved in the management and administration of MOUD in MAT patients during the pandemic crisis. These factors are “Mood”, “Substance administration and pandemic measures”, “Sociability”, “Accessibility to therapeutic programs”, “Biopsychosocial support from therapeutic programs” and “Wellness”.

Research findings indicate that patients with OUDs have experienced the consequences of COVID-19 pandemic and the subsequent restriction measures to a large extent facing increased stress, isolation, and sense of insecurity combined with serious health problems due to opioid use (Tracy et al., 2021). Moreover, parameters that exacerbate the negative impact of COVID-19, such as social stigma, lack or confinement in the availability of the services (i.e., medical care and psychosocial support) of MAT programs and difficulties in the accessibility (e.g., residence in remote areas) of the patients in MAT programs seem to negatively affect treatment retention and overdose prevention (Corace et al., 2022; Krawczyk et al., 2022; Lister & Lister, 2021; Nunes et al., 2021; Rosenblum et al., 2011).

Mood, stress, craving, and drug use are strongly interrelated as craving seems to be increased in the presence of both stressful conditions and drug cues (Preston et al., 2018). Mood, a parameter that is utterly dependent on the COVID-19 pandemic, is a very sensitive indicator whether a patient with OUDs will continue attending the MAT program. This is the case especially for the “negative mood” when we refer to patients under

buprenorphine maintenance treatment (BMT) (Panlilio et al., 2019; Preston et al., 2018). It has also been indicated the relation of “negative mood” with the administration and the retention in treatment leading to dropout in BMT patients (Hser et al., 2014; Mattick et al., 2014). In addition, recent data has revealed that COVID-19 stress syndrome could highly motivate an individual that belongs to a vulnerable group (e.g., opioid addicts) to use alcohol or drugs to cope with the negative manifold impact of COVID-19 pandemic (Taylor et al., 2021); however, there is lack of evidence regarding patients under MAT. Similarly, individuals that used drugs occasionally before the pandemic crisis, increased the dosage to cope with self-isolation induced by the restriction measures (Taylor et al., 2021). Sociability has been associated with substance use mainly in male adults, whilst it is positively related to the availability of healthcare services (Chen et al., 2019; Pettersen et al., 2019). Noteworthy, it has been demonstrated that the social network constitutes a crucial factor regarding the outcome of a therapeutic program, whereas the development of social relations within the therapeutic programs can increase the possibilities for rehabilitation (Neale et al., 2018; Weston et al., 2018). On the contrary, the fact that opioid-addicted patients are a stigmatized and marginalized population, the lack of treatment availability and the absence of attractive therapeutic programs are considered serious barriers to engagement and retention in treatment (Nunes et al., 2021). Unfortunately, to our knowledge there are no instruments to address the role of these factors on management of MOUD as pinpointed by the patients themselves.

This study partly deals with this gap in the literature. Indeed, according to the findings reported herein, sociability was related with the dimensions “Anticipation of relief from withdrawal or dysphoria” and “Lack of control over use” presented in HCQ and with the factor “energy level” of NHP, indicating the relation of energy, as a factor of QoL and wellness, with the sociability and maintenance of social relationships. Crises including COVID-19 pandemic have been associated with social isolation, depression and anxiety (Chiappini et al., 2020; Nguyen & Buxton, 2021), factors that potentially lead to enhancement of vulnerability and higher risk of substance use (Goldmann & Galea, 2014). These are main consequences of pandemic since psychosocial support offered from MAT programs allows continuous monitoring of the treatment program, especially when the patients visit the premises of relevant organizations daily, which is not the case during pandemic (Leventelis et al., 2020a). Noteworthy, intense social support has been associated with higher retention and completion of treatment (Dobkin et al., 2002). Based on the findings by factor analysis, accessibility to the therapeutic programs plays a pivotal role affecting opioid maintenance treatment and in conjunction with negative mood and social distancing influences the retention in treatment and risk of overdose (Joudrey et al., 2021; Nunes et al., 2021; Ravndal & Amundsen, 2010). Recent data indicate that these three factors result in a greater risk for treatment dropout (Lister & Lister, 2021).

The present study, through the introduction of PANMAT/Q, aims to offer a tool for the valid and reliable assessment of the role of pandemic crises in general on the efficacy of MAT on patients under buprenorphine and methadone. This becomes necessary since, according to the scarce literature, the results regarding the impact of COVID-19 measures on management of MOUD by patients themselves are ambiguous. It has been demonstrated either a rise in overdose death rates (Kelley et al., 2021), or no effect on the same parameter after increase of the take-home doses due to pandemic measures (Brothers et al., 2021; Joseph et al., 2021). It appears to be a fact though, that SARS-CoV-2 induces inflammation of the central nervous system leading to the deregulation of the functions of serotonin, dopamine and glutamate, which are directly linked to the use

and misuse of addictive substances (Cisneros & Cunningham, 2021). Furthermore, according to our findings, the pandemic crisis affects patients under methadone maintenance treatment (MMT) in higher extent than those under BMT in all PANMAT/Q factors except for the factor “Accessibility”. Research data has demonstrated that BMT patients exhibit greater increase in “positive mood” (Nunes et al., 2021), while MMT has been associated with decrease in mortality rates (Nolan et al., 2015).

Conclusion

Given the high potential for fatal overdose in patients suffering from OUDs, an urgent need arises to understand how this population has experienced the changes that have been made following pandemic crisis in the assessment of addiction treatment. It appears that PANMAT/Q addresses this matter properly, since it is a multidimensional instrument that displays high reliability and validity, which are necessary elements to export valid results (Polit & Beck, 2008). We report a successful development and validation of PANMAT/Q in MAT patients under methadone and buprenorphine, as the questionnaire demonstrated internal consistency, reliability and predictive and construct validity reassuring that it can serve as a valuable tool for the assessment of the impact of COVID-19 pandemic on opioid-addicted patients in MAT. It can also serve as a useful and comprehensive method for clinicians helping in better identifying patient needs being in high risk for relapse and fatal overdose due to extreme social circumstances that will putatively arise in the future.

Declarations

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Financial interests. *The authors declare they have no financial interests.*

Competing Interests. Christonikos Leventelis, Alexandra Katsouli, Vasilios Stavropoulos, Anna Karasavvidou, Panagiotis Papadopoulos, Petros T. Barmpas, Sotiris Tasoulis, Aristidis S. Veskoukis and Maria Tsironi declare that they have no conflict of interest.

Ethical approval. Ethical Approval was gotten from the Nursing Department of the University of Peloponnese, Tripoli, Greece and the scientific committee of OKANA.

All procedures followed were in accordance with the ethical standards of the responsible committee in human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000.

Informed Consent. Informed written consent was obtained from all patients for being included in the study.

Data Availability. The data used to support the findings of this study are available from the corresponding author upon request.

Author contributions. Christonikos Leventelis and Alexandra Katsouli contributed to the study conception and design. Material preparation, data collection and analysis were performed by Vasilios Stavropoulos, Anna Karasavvidou, Panagiotis Papadopoulos, Petros T. Barmpas, Sotiris Tasoulis. The first draft of the manuscript

was written by Christonikos Leventelis and Aristidis S. Veskoukis. Supervision was performend by Aristidis S. Veskoukis and Maria Tsironi.

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