Article

Exploring Personality and Readiness to Change in Patients With Substance Use Disorders With and Without ADHD

Journal of Attention Disorders
1–11

DOI: 10.1177/1087054716677819
jad.sagepub.com
SAGE

L. Flores-García[1],2, E. Ytterstad[2], M. B. Lensing[3], and M. Eisemann[2]

Abstract

Objective: To explore personality and readiness to change among substance use disorders (SUD) patients with and without ADHD. **Method:** SUD + ADHD versus SUD − ADHD patients consecutively entering treatment between 2010 and 2012 were compared concerning personality (Temperament and Character Inventory) and readiness to change (Stages of Change Readiness and Treatment Eagerness Scale). **Results:** Among 103 SUD patients (76 men, age *M* = 43.3, *SD* = 11.1), 16 (15.5%) were diagnosed with ADHD. SUD + ADHD patients reported significantly elevated eagerness to effort ($p = .008$) compared with SUD − ADHD patients, who reported significantly elevated fear of uncertainty ($p < .000$). SUD + ADHD patients reported higher ambition ($p = .025$), self-forgetfulness ($p = .029$), and lower recognition ($p = .022$). They were younger ($p = .019$) and showed more often amphetamine addiction ($p = .022$) compared with SUD − ADHD patients. **Conclusion:** The distinct characteristics found in SUD + ADHD and SUD − ADHD patients underline the need for differentiated treatment interventions. *(J. of Att. Dis. XXXX; XX(X) XX-XX)*

Keywords

substance use disorders, ADHD, personality, change readiness

ADHD is a neurodevelopmental disorder (American Psychiatric Association [APA], 2013), prevalent in around 5% of the adult population (Willcutt, 2012). The core symptoms of ADHD, inattention, impulsivity and hyperactivity (Biederman et al., 2012) often manifest in adults as forgetting important appointments, having difficulties in planning and organizing everyday life tasks (Miranda, Berenguer, Colomer, & Rosello, 2014). Adults with ADHD may also seek immediate rewards without considering the consequences of their behavior (Sonuga-Barke, 2003). Other challenges such as over-talkativeness, inner restlessness (Kooij et al., 2010) or emotional dysregulation (Asherson, Buitelaar, Faraone, & Rohde, 2016) are often present in adults with ADHD.

Substance use disorders (SUD) are characterized by a compulsive substance use, tolerance, withdrawal, and craving of addictive substances in spite of negative consequences and by unsuccessfully trying to stop using (APA, 2000, 2013).

ADHD is frequently comorbid with SUD (Wilens et al., 2005). Among SUD treatment seekers prevalence rates between 5% and 31% of ADHD have been reported (van de Glind et al., 2014).

In clinical settings, SUD + ADHD adults are found to be younger (Johann, Bobbe, Putzhammer, & Wodarz, 2003) and to have substantially higher rates of other psychiatric comorbidity (van Emmerik-van Oortmerssen et al., 2014) compared with SUD − ADHD adults. SUD + ADHD adults exhibit more severe and earlier onset of substance use, which develops faster into addiction (Ohlmeier et al., 2007) and have been found to have higher rates of SUD treatment drop out than SUD − ADHD adults (Levin et al., 2004).

Both SUD and ADHD are impairing brain disorders (APA, 2013; Volkow & Baler, 2014) with similar cognitive, emotional, reward, and motivational deficits (Asherson et al., 2016; Volkow & Baler, 2014). Moreover, individuals with SUD + ADHD often experience a lack of control over own lives (Løvaas & Dahl, 2013).

Personality

Cloninger, Przybeck, Svrakic, and Wetzel (1994) describe personality in light of temperament (mainly biologically determined and stable over time) and character (susceptible to environmental influences). Four traits comprise temperament: novelty seeking, harm avoidance, reward dependence, and persistence. Three domains comprise character: self-directedness, cooperativeness, and self-transcendence (for a detailed description, see

[1]University Hospital of Northern Norway, Tromsø, Norway
[2]UiT—The Arctic University of Norway, Norway
[3]Oslo University Hospital, Norway

Corresponding Author:[AQ1]
L. Flores-García, University Hospital of Northern Norway, Postbox 6124, Tromsø 9291, Norway.
Email: lizbett.flores@unn.no

Cloninger et al., 1994). There is limited literature comparing specifically SUD patients with and without ADHD. However, high novelty seeking (Sizoo, van den Brink, Gorissen van Eenige, & van der Gaag, 2009) and low cooperativeness (Hofvander et al., 2011) are found to characterize adults with comorbid SUD and ADHD. Otherwise, the literature suggests that adults with ADHD show elevated novelty seeking and harm avoidance (Evren, Evren, Yancar, & Erkiran, 2007; Le Bon et al., 2004), self-transcendence (Faraone, Kunwar, Adamson, & Biederman, 2009), and lowered self-directedness and cooperativeness (Salgado et al., 2009).

Readiness to Change

The stages of change model is a framework to understand how people intentionally change problematic behavior and is widely used in SUD treatment (Nidecker, DiClemente, Bennett, & Bellack, 2008; Prochaska, DiClemente, & Norcross, 1992). The six stages of change are precontemplation (no recognition of the problematic behavior), contemplation (ambivalence), preparation (readiness), action (taking steps to change), maintenance, and relapse (Prochaska et al., 1992). Research on adults with SUD alone or with additional mental diseases suggests that executive functioning, awareness of symptom severity and self-reflection are important enablers of readiness to change problematic substance use (Blume & Schmaling, 1997; Blume, Schmaling, & Marlatt, 2005; Le Berre et al., 2012). The issues related to attentional problems, reward-processing, and inhibitory deficits may challenge the process of change, particularly in SUD + ADHD patients due to their inattention problems (Marx, Krause, Berger, & Hassler, 2014).

Based on some evidence that SUD patients with and without ADHD differ in personality styles and readiness to change, the question arises whether treatment interventions should adapt to the needs of the different groups. Although the concepts personality and readiness to change are widely used in the SUD field (Belcher, Volkow, Moeller, & Ferre, 2014; DiClemente, Schlundt, & Gemmell, 2004; Nidecker et al., 2008), research on their utility is still limited. The present naturalistic study aimed to explore possible differences in personality and readiness to change between SUD + ADHD and SUD – ADHD patients referred to SUD treatment. Our research questions were the following:

1. Do SUD + ADHD patients show higher novelty seeking, higher self-transcendence, and lower harm avoidance compared with SUD – ADHD patients?
2. Do both patient groups show low self-directedness and cooperativeness?
3. Do SUD + ADHD patients show lower readiness to change than SUD – ADHD patients?

Method

Participants

The recruitment process is shown in Figure 1. Altogether, 216 previously detoxicated patients consecutively entering SUD treatment between February 2010 and July 2012 at the University hospital in Northern Norway were eligible: 193 from the ReStart Unit and 23 from the Therapeutic Community Færingen Unit. Exclusion criteria were behavior hindering compliance (e.g., aggressiveness), serious mental conditions (e.g., psychosis, dementia), physical conditions (e.g., chronic pain), or not speaking the Norwegian language. Those who accepted to participate signed informed consent after having received written and oral information about the study. Writing/reading assistance was offered. Due to ethical considerations, it was not possible to make inferences between SUD patients agreeing to participate and those declining.

ADHD diagnosis. From a sample of 103 SUD patients, 24 were assessed for ADHD by clinical experts, independently of this naturalistic study. We obtained information on the assessment and diagnosis of ADHD (International Classification of Diseases 10th Revision ICD-10; World Health Organization, 1992) from chart reviews.[AQ2] The ADHD assessment was well documented in the medical records and followed the national guidelines for the diagnosis of ADHD (Sosial-og Helsedirektoratet, 2007).[AQ3] Eight patients were assessed for ADHD at the time of the study and 16 before the study. From SUD + ADHD patients only, information regarding age at assessment and previous and present pharmacological treatment for ADHD was collected. Pharmacological treatment was routinely monitored by the units' physicians.

Measures

In both wards, current Axis I psychopathology was assessed by means of the psychiatric interview M.I.N.I. PLUS (Sheehan et al., 1994). In the unit ReStart, the majority of interviews were conducted by trained clinicians and reviewed by the unit's chief psychologist, who made the final evaluation. Axis II disorders were assessed in both wards only when considered necessary and then conducted by the chief psychologist utilizing Structured Clinical Interview for *DSM-IV* (SCID II; First, Spitzer, Gibbon, Williams, & Benjamin, 1995). ICD-10 diagnostic criteria were applied.

Personality was measured with the Temperament and Character Inventory (TCI; Cloninger et al., 1994). TCI consists of 240 items with dichotomous response alternatives (true/false). Although there is limited

information on Cronbach's alpha for this present

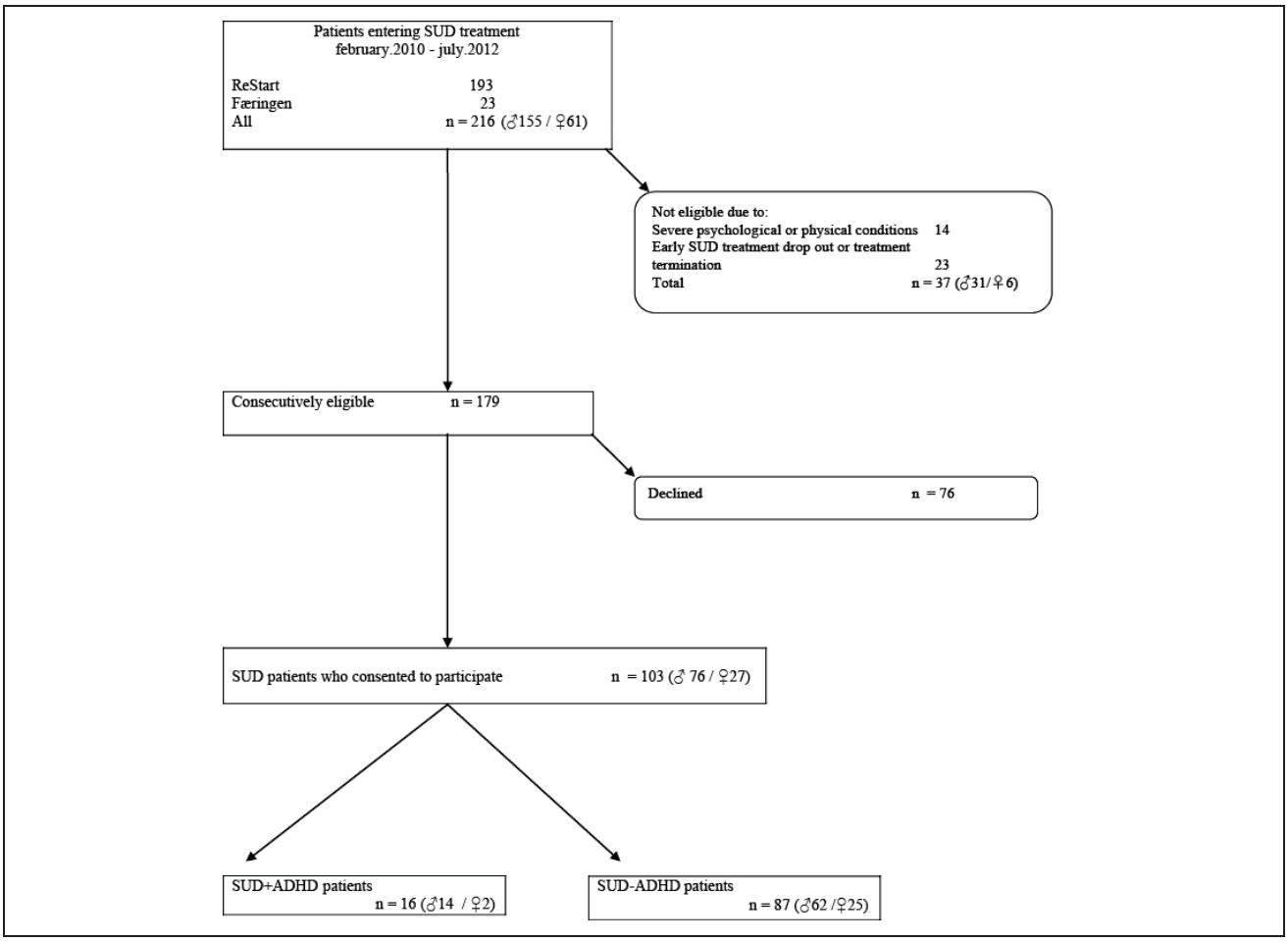

Figure 1. Study flowchart for SUD patients with and without ADHD.
Note. SUD = substance use disorders.

TCI version, reliability coefficients from other versions have been satisfactory (Cloninger et al., 1994). The internal consistency of the four temperament dimensions were .74, .88, .77, and .88 and for the three character dimensions .87, .85, and .78, respectively.

Readiness to change was measured by the Stages of Change Readiness and Treatment Eagerness, client version (SOCRATES 8), based on the readiness to change model previously described (Miller & Tonigan, 1996). The SOCRATES consists of three subscales comprising 19 items on a 5-point Likert-type scale (ranging from 1 = *strongly disagree* to 5 = *strongly agree*). The three SOCRATES subscales are recognition (scores > 32 = medium or higher indicate increased recognition of having a problematic substance use), ambivalence (scores > 15 = medium or higher indicate increased ambivalence in relation to the substance of use) and taking steps (scores > 33 = medium or higher, indicate high degree of taking action to change problematic substance use; Miller & Tonigan, 1996). The SOCRATES has been found to be useful for the assessment of readiness to change in alcohol and other substances (Burrow-Sanchez & Lundberg, 2007). Participants completed one questionnaire for each substance they considered themselves having problems with. Cronbach's alpha coefficients for recognition (.85-.94), for ambivalence (.37-.88), and for taking steps (.82-.95) were in line with previous studies (Abiola, Udofia, Sheikh, & Sanni, 2015; Miller & Tonigan, 1996).

Self-reported alcohol consumption was measured by the Alcohol Use Disorder Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). AUDIT consists of 10 questions on the frequency of alcohol use, providing five response options (never = 0, daily = 4) except for the last two questions (never = 0, not this last year = 2, during the last year = 4) and yielding a maximum score of 40. Scores >8 indicate risk drinking, whereas excessive drinking is present if scores are >20 (Babor et al., 2001). Internal consistency reliability of Cronbach's alpha .77 has been reported previously (Rumpf, Wohlert,

Freyer-Adam, Grothues, & Bischof, 2013), compared with .93 in this study.

Self-reported drug use was assessed by means of the Drug Use Disorder Identification Test (DUDIT; Berman, Bergman, Palmstierna, & Schlyter, 2005). DUDIT is similar to AUDIT in structure, consisting of 11 questions, yielding a maximum score of 44. Scores >25 are associated with substance dependence (Berman et al., 2005). Cronbach's alpha coefficients reported have been between .80 and .90 (Hildebrand, 2015), compared with .98 in the present study.

ADHD symptoms were measured with the 18-item version of the Adult ADHD Self-Report Scale (ASRS; Kessler et al., 2005), which is based on the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; APA, 2000) ADHD diagnostic criteria (APA, 2000). The answer alternatives are provided by a 5-point Likert-type format (*never* = 0, *very often* = 4). The first six items comprising part A also constitute the ASRS screener (i.e., ASRS v.1.1), which has been found to be more predictive of ADHD (Kessler et al., 2005). We preferred the full version over the screener version of the ASRS to be able to compare both SUD groups in all symptomatology. Maximum scores for part A is 24 and 48 for part B. Scores of 14 and above on the ASRS represent a high ADHD symptomatology (Kessler et al., 2005). Cronbach's alpha coefficients have been previously reported to be .86 for both subscales (Gjervan, Torgersen, Rasmussen, & Nordahl, 2014), compared with .88 for part A and .93 for part B in our study.

Statistical Analyses

Initially, we calculated mean, standard deviation, median and range for all scales, and continuous variables and percentages for the categorical variables. These calculations were performed on all SUD patients as well as split data by ADHD diagnosis or not. To test for differences between the SUD + ADHD group and SUD − ADHD group in the primary analyses, we used chi-square tests for categorical variables and both *t*-tests and Mann–Whitney *U*-tests for scale and continuous variables. Since all Mann–Whitney *p* values were similar to those from the *t*-tests, we present only *t*-tests results. Regarding TCI, we report intergroup differences on temperament and character traits and subdimensions. Regarding the SOCRATES subscales, participants completed a questionnaire for each substance they considered having problems with. Due to these repeated measurements in the SOCRATES, we used a mixed model with individual as random factor, generic group as well as the ADHD diagnosis as fixed factors. To test for consistency of findings, we expanded the statistical models to either a multiple linear regression or logistic regression model adjusting for possible confounders such as age and comorbid mood disorders. We additionally adjusted for substance use/psychiatric problems and ADHD in consanguineous relatives as self-reported by all SUD patients. Effect size (Cohen's *d*) was calculated. Due to multiple testing, we have lowered our significance level to < .01, whereas results with *p* value < .05 were regarded as tendencies. SPSS v.22 (IBM Corp, 2013) and the statistical computing language R (R Core Team, 2015) were used for the statistical analyses. For the mixed model regarding the SOCRATES, we used R-function lmer() in package lme4 (Bates, Maechler, Bolker, & Walker, 2015).

Ethics

The study was approved by the regional committees for medical and health research ethics, REK sør-øst B, 2009/1355b.

Results

Clinical Characteristics

The study comprised 76 male and 27 female SUD patients with a mean age of 43.1 and 44.0 years, respectively (data not shown). As there were only two women among the 16 participants diagnosed with ADHD, it was not possible to adjust for gender when comparing the SUD + ADHD group with the SUD − ADHD group. As shown in Table 1, no significant differences between groups were found. However, SUD + ADHD patients tended ($p < .05$) to be younger, were less often diagnosed with alcohol use disorders and more often with amphetamine use disorders compared with the SUD − ADHD patients.

ADHD diagnosis. Of the 24 participants assessed for ADHD (four women), 21 (91.4%) underwent ADHD assessment as adults (three women). Eight out of the 24 assessed did not fulfill ADHD criteria. Mean age at time of ADHD diagnosis for the remaining 16 SUD patients (15.5%) was 33.7 ± 10.5 years, range = 28-50. Mean observation time (e.g., since ADHD diagnosis was received and the current study) was 3.7 ± 3.5 years, range = 22-50. At the time of the study, seven SUD + ADHD patients were treated psychopharmacologically with either short or long-acting methylphenidate for their ADHD, whereof five reported positive to very positive response.

Table 2 presents the comparison between SUD + ADHD versus SUD − ADHD patients in terms of personality and readiness to change. We report age-adjusted results only because similar results were found after adjusting for either age alone, age and comorbid mood disorders or age and substance use problems/psychiatric problems/ADHD diagnosis in first-

degree and second-degree family members (self-reported hereditary aspects are found in Table 3).

Table 1. Sociodemographic and Clinical Characteristics of SUD Patients by ADHD Diagnosis (N = 103).

	All SUD patients				SUD + ADHD group				SUD − ADHD group				SUD + ADHD vs. SUD − ADHD		
Patient characteristics	*M*	*SD*	%	*n*	*M*	*SD*	%	*n*	*M*	*SD*	%	*n*	Statistic	*p*	
Age	43.3	11.1		103	37.4	8.5		16	44.4	11.2		87	$t = -2.38$	.019	*
Onset age of substance use	15.1	5.0		96	13.6	2.7		15	15.4	5.2		81	$t = -1.32$	.191	
Gender: Men			73.8	76			87.5	14			71.3	62	$\chi^2 = 1.10$	.295	
Living with partner: Yes (missing = 1)			19.6	20			18.8	3			19.8	17	$\chi^2 = 0.19$	.907	
Education													$\chi^2 = 0.18$	.916	
Compulsory education[a]			40.8	42			43.8	7			40.2	35			
Senior secondary education[b]			50.5	52			50.0	8			50.6	44			
Higher education			8.7	9			6.2	1			9.2	8			
Income[c] (missing = 1)													$\chi^2 = 2.27$	.519	
Paid work			8.8	9			6.2	1			9.3	8			
Temporary social welfare[d]			52.0	53			68.8	11			48.8	42			
Permanent disability welfare[e]			32.4	33			18.8	3			34.9	30			
Under education			6.9	7			6.2	1			7	6			
Occupational status (missing = 3)															
Employed[f]			17.0	17			6.7	1			18.8	16			
Unemployed			82.0	82			86.7	13			81.2	69			
Under education			1.0	1			6.7	1			0	0			
Housing conditions[c]													$\chi^2 = 0.64$	.725	
Homeless/shelter/living with others			19.4	20			25.0	4			18.4	16			
Owned or rented residence[g]			70.9	73			62.5	10			72.4	63			
Institution			9.7	10			12.5	2			9.2	8			
Suicidal attempt: Yes (missing = 2)			40.6	41			18.8	3			44.7	38	$\chi^2 = 2.76$	.096	
Previous treatment for mental health problems: Yes[h] (missing = 1)			77.5	79			87.5	14			75.6	65	$\chi^2 = 0.52$	.500	
Previous SUD treatment: Yes[h] (missing = 2)			73.3	74			81.2	13			71.8	61	$\chi^2 = 0.23$	.632	
Axis I current disorders (F20-F50)			21.4	22			18.8	3			21.8	19	$\chi^2 = 0.00$	1.000	
Axis II personality disorders (F60)			3.9	4			0	0			4.6	4			
SUD diagnoses (F10-F15)															
Alcohol			67.0	69			37.5	6			72.4	63	$\chi^2 = 5.95$	.015	*
Opioids[i]			19.4	20			25.0	4			18.4	16	$\chi^2 = 0.07$	.787	
Cannabis			21.4	22			18.8	3			21.8	19	$\chi^2 = 0.00$	1.000	
Benzodiazepines			14.6	15			18.8	3			13.8	12	$\chi^2 = 0.02$	.896	
Amphetamines			29.1	30			56.2	9			24.1	21	$\chi^2 = 5.29$	.022	*
Two or more SUD diagnoses			35.9	37			43.8	7			34.5	30	$\chi^2 = 0.18$	.670	
Only SUD diagnoses			75.7	78			81.2	13			74.7	65	$\chi^2 = 0.06$	.808	
Self-reported substance use[j]															
Alcohol			66.0	68			50.0	8			67.0	60	$\chi^2 = 1.40$	.236	
Opioids			12.6	13			12.5	2			12.6	11	$\chi^2 = 0.00$	1.000	
Cannabis			27.2	28			37.5	6			25.3	22	$\chi^2 = 0.49$	.482	
Benzodiazepines			11.7	12			18.8	3			10.3	9	$\chi^2 = 0.29$	.590	
Amphetamines			28.2	29			50.0	8			24.1	21	$\chi^2 = 3.28$	.070	

Note. SUD = substance use disorders; t = student t-statistic; χ^2 = Pearson's chi-square statistic.

[a]Ten years of compulsory education included three unfinished education.

[b]Including both academic oriented and vocationally oriented (3 and 4 years, respectively).

[c]Four weeks prior to SUD treatment.

[d]Including sick leave, unemployment, and rehabilitation.

[e]Including disability pension and retirement.

[f]Including part-time.

[g]Including municipal residence.

[h]Including polyclinical and/or institution.

[i]Receiving opioid replacement therapy: 31.4% (n = 13).

[j]Patients reported the substances they considered having problems with, which in many cases was more than one. Therefore, the counts in self-reported substance use differ from N participants.

*$p \leq .05$ (two-tailed).

Table 2. Comparison of the Degree of Substance Use, ADHD Symptoms, Personality and Readiness to Change in SUD + ADHD and SUD − ADHD Patients (N = 97).

	All SUD patients			SUD + ADHD group			SUD − ADHD group			SUD + ADHD vs. SUD − ADHD					
Variables	*M*	*SD*	*N*	*M*	*SD*	*N*	*M*	*SD*	*N*	95% CI	|*t*|	*p*		Cohen's d	Adjusted[a] *p*	
AUDIT	21.4	11.7	97	14.0	11.7	16	22.9	11.2	81	[−15.0, −2.8]	2.89	.005	**	0.79	.017	*
DUDIT	15.6	17.1	97	24.1	16.3	16	13.9	16.8	81	[1.0, 19.2]	2.21	.029	*	0.61	.363	
ASRS			97													
Part A	12.5	5.9		17.4	4.6	16	11.5	5.7	81	[2.9, 8.9]	3.90	.000	***	1.07	.003	**
Part B	24.2	10.0		32.1	7.3	16	22.6	9.8	81	[4.3, 14.6]	3.67	.000	***	1.00	.005	**
SOCRATES			150[b]			27[b]			123[b]							
Recognition	29.5	6.1		26.4	6.0		30.2	5.9		[−6.2, −0.8]	2.57	.010	**	0.67[c]	.022	*
Ambivalence	13.1	4.1		12.3	3.8		13.2	4.1		[−2.8, 1.4]	0.67	.506		0.27c	.581	
Taking steps	34.9	5.5		36.3	3.7		34.6	5.8		[−1.1, 4.4]	1.15	.249		0.39[c]	.340	
TCI-Temperament																
Novelty-seeking	19.9	5.2	92	23.1	4.7	15	19.3	5.1	77	[0.9, 6.5]	2.63	.010	**	0.74	.108	
Impulsiveness	4.9	2.1	92	6.0	1.9	15	4.7	2.1	77	[0.2, 2.5]	2.25	.027	*	0.64	.159	
Harm avoidance	18.8	7.0	92	14.9	6.1	15	19.6	7.0	77	[−8.5, −0.8]	2.40	.019	*	0.68	.018	*
Fear of uncertainty	4.4	1.8	92	2.8	1.5	15	4.7	1.7	77	[−2.8, −1.0]	4.07	.000	***	1.15	.000	***
Fatigability	4.6	2.4	92	3.5	2.6	15	4.8	2.3	77	[−2.6, 0.0]	2.00	.049	*	0.56	.064	
Reward dependence	17.2	4.9	92	16.5	4.4	15	17.4	5.0	77	[−3.7, 1.8]	0.67	.504		0.19	.633	
Dependence	3.8	1.2	92	3.1	1.0	15	3.9	1.2	77	[−1.4, −0.1]	2.24	.028	*	0.63	.053	*
Persistence	17.1	7.4	92	21.1	8.1	15	16.3	7.1	77	[0.7, 8.9]	2.34	.021	*	0.66	.017	*
Eagerness to effort	4.2	2.8	92	5.6	2.6	15	3.9	2.7	77	[0.2, 3.2]	2.19	.031	*	0.62	.008	**
Ambitious	4.1	2.2	92	5.6	2.4	15	3.8	2.1	77	[0.5, 3.0]	2.89	.005	**	0.82	.025	*
TCI-Character																
Self-directedness	22.3	7.7	92	22.5	7.6	15	22.2	7.7	77	[−4.1, 4.6]	0.11	.915		0.03	.641	
Cooperativeness	25.5	6.1	92	25.3	4.7	15	25.6	6.3	77	[−3.7, 3.2]	0.14	.891		0.04	.769	
Self-transcendence	9.6	4.7	92	11.7	4.3	15	9.2	4.7	77	[−0.1, 5.1]	1.92	.057		0.54	.077	
Self-forgetful	4.6	2.4	92	6.1	1.7	15	4.4	2.4	77	[0.5, 3.1]	2.76	.007	**	0.78	.029	*

Note. SUD = substance use disorders; CI = confidence interval = AUDIT = Alcohol Use Disorder Identification Test; DUDIT = Drug Use Disorder Identification Test; ASRS = Adult ADHD Self-Report Scale; SOCRATES = The Stages of Change Readiness and Treatment Eagerness Scale; TCI = Temperament and Character Inventory.

[a]Adjusted for age.

[b]Patients completed one questionnaire for each substance they considered as problematic. For this variable, *n* represents the number of completed questionnaires, rather number of patients.

[c]Adjusted for generic group in a mixed model.

*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$ (two-tailed).

Table 3. Self-Reported Hereditary Aspects of ADHD + SUD and SUD − ADHD Patients (N = 94).

	All SUD patients		SUD + ADHD group		SUD − ADHD group	
Patient characteristics	%	*n*	%	*n*	%	*n*
ADHD diagnosis in consanguineous relatives		94		16		78
No	76.6	72	43.8	7	83.3	65
First-degree relative(s)	7.4	7	18.8	3	5.1	4
Second-degree relative(s)	5.3	5	18.8	3	2.6	2
Both first and second-degree relatives[a]	4.3	4	12.5	2	2.6	2
Not sure	6.4	6	6.2	1	6.4	5
Substance use and/or psychiatric problems in consanguineous relatives		94		16		78
No	27.7	26	6.2	1	32.1	25
Substance use in first-degree relative(s)	24.5	23	43.8	7	20.5	16
Substance use in second-degree relative(s)	5.3	5	0	0	6.4	5
Substance use in both first and second-degree relatives[a]	7.4	7	12.5	2	6.4	5
Other psychiatric problems[b]	13.8	13	18.8	3	12.8	10
Both substance use and other psychiatric problems	14.9	14	12.5	2	15.4	12
Not sure	6.4	6	6.2	1	6.4	5

Note. SUD = substance use disorders.

[a]Different relatives of those counted into the two previous categories.

[b]Most frequently reported mood and anxiety problems. Including first- and second-degree relatives.

Personality

As shown in Table 2, in unadjusted results, SUD + ADHD patients reported significantly ($p < .01$) higher ambition (persistence subdimension) and self-forgetfulness (self-transcendence subdimension) than SUD − ADHD patients, who reported significantly higher fear of uncertainty (harm avoidance subdimension). SUD + ADHD patients tended ($p < .05$) to report elevated impulsiveness (novelty seeking subdimension) and eagerness to effort (persistence subdimension) compared with SUD − ADHD patients. Furthermore, SUD − ADHD patients tended to report higher fatigability (harm avoidance subdimension) and dependence (reward dependence subdimension) scores, compared with SUD + ADHD patients. When adjusted for age, eagerness to effort among SUD + ADHD patients compared with SUD − ADHD patients, became significant. The significantly higher fear of uncertainty among SUD − ADHD patients compared with SUD + ADHD patients, remained. In addition, SUD + ADHD patients tended to report higher scores on ambition and self-forgetfulness, compared with SUD − ADHD patients. The effect size for fear of uncertainty was large, whereas the effect sizes for the significant differences and tendencies were medium.

Readiness to Change

A significantly lower recognition of problematic substance use in SUD + ADHD patients compared with SUD − ADHD patients was found. However, after adjusting for age, this difference became a tendency with a medium effect, as seen in Table 2. As individuals under opioid maintenance therapy might not consider their opiate addiction as problematic, we controlled for this variable both in the original and the adjusted analyses, and the results were almost identical (data not shown).

Discussion

The aim of this study was to explore possible differences in personality and readiness to change between SUD + ADHD patients and SUD − ADHD patients. With regard to personality, SUD + ADHD patients were characterized by lowered harm avoidance, specifically, they reported significantly lower scores on the subdimension fear of uncertainty. They were also characterized by elevated persistence, reporting significantly higher eagerness to effort scores and tending to report elevated ambition. Although no significant differences were found between groups in self-transcendence, SUD + ADHD patients tended to report elevated self-forgetfulness, a subdimension of self-transcendence, compared with SUD − ADHD patients. There were no differences between groups on high novelty seeking, low self-directedness, and cooperativeness. As for readiness to change, no significant differences were found between groups. However, SUD + ADHD patients tended to report lower recognition to change problematic substance use compared with SUD − ADHD patients.

Cloninger et al. (1994) proposed that people with lowered harm avoidance and fear of uncertainty are energetic, daring and less careful even in situations in which one is expected to be cautious. Likely related to the executive deficits in ADHD, SUD + ADHD patients make less thorough decisions in situations concerning substance use, which can impact them negatively. Furthermore, the elevated eagerness to effort among SUD + ADHD patients indicates zeal to initiate tasks in response to anticipated reward (Cloninger et al., 1994). Interestingly, SUD + ADHD patients did not report elevated scores on the other persistence subdimensions of perfectionism and work hard (Supplementary Table 1). Salgado et al. (2009) found high persistence related to the hyperactive and impulsive domains of ADHD. The elevated eagerness to effort among SUD + ADHD patients compared with SUD − ADHD patients might additionally be related to the emotional intensity, characteristic of ADHD (Kooij et al., 2010). SUD + ADHD patients low in fear of uncertainty and high eagerness to effort might be flexible to try different treatment strategies. On the other hand, SUD + ADHD patients might incur in high risk situations, give up tasks easily, hence sticking to the treatment plan less meaningfully.

The tendencies among SUD + ADHD patients of lowered recognition of having a problematic substance use, in addition to being ambitious and self-forgetful, can be related to the attentional problems, reward-processing and self-monitoring deficits in ADHD (Asherson et al., 2016). A prerequisite for intentional change to take place is recognizing the problematic behavior (Prochaska et al., 1992). In SUD + ADHD patients, the attention problems possibly interfere with making thorough reflections regarding own substance use.

For instance, Tamm, Adinoff, Nakonezny, Winhusen, and Riggs (2012) found that the inattentive presentation of ADHD among comorbid SUD adolescents was associated with a lowered readiness to change. Moreover, the elevated self-forgetfulness among SUD + ADHD patients might be related to their lowered recognition of having problematic substance use. Self-forgetfulness refers to losing the notion of time and space, being creative and immerse in the moment (Cloninger et al., 1994). Such a definition of self-forgetfulness resembles the unintentional mind-wandering in ADHD (Mostert et al., 2016), which can be maladaptive because it is involuntary. The hyperactive and impulsive aspects of ADHD might be

related to the elevated ambition among SUD + ADHD patients. These can be expressed as frequent emerging plans or ideas that get initiated but remain unfinished (Kooij et al., 2010).

The high novelty seeking (i.e., acting before thinking, quick temper, mood swings, impulsivity) found in both SUD patient groups is in line with earlier research (e.g., Evren et al., 2007; Sizoo et al., 2009) but contrary to our expectations. The deficits in the reward system in SUD (Volkow & Baler, 2014), where the goal-directed behavior becomes biased toward substance-related activities, may explain these findings. The low self-directedness and cooperativeness scores we found in both SUD groups have consistently been linked to psychopathology (e.g., Josefsson et al., 2011; Pedrero Perez et al., 2011). Elevated self-directedness and cooperativeness reflect a self-regulated purposeful, responsible, empathetic and tolerant character (Cloninger et al., 1994). Notably, elevated self-directedness and cooperativeness are associated with maturity and well-being, independently of temperament styles (Cloninger, 2004; Cloninger & Zohar, 2011). Thus, increased self-awareness about own resources and challenges might facilitate purposefulness and maturity.

Clinical Characteristics

No significant differences were found between groups in terms of clinical characteristics. However, SUD + ADHD patients tended to be younger and had more frequently amphetamine addiction than SUD − ADHD patients. SUD − ADHD patients tended to be more often diagnosed with alcohol SUD. These tendencies were in line with the literature (Evren et al., 2007; Johann et al., 2003; van Emmerik-van Oortmerssen et al., 2014). Contrary to previous findings consistently suggesting a higher psychiatric comorbidity among SUD and ADHD patients (van Emmerik-van Oortmerssen et al., 2014; Wilens et al., 2005), a high frequency of Axis I (current) and Axis II psychiatric comorbidities (particularly anxiety, depression, borderline, schizoid and antisocial personality disorders) was found among SUD − ADHD patients only.

In line with other studies, we found a prevalence of adult ADHD among SUD patients of 15.5%, the vast majority (91%) were assessed as adults (Halmoy, Fasmer, Gillberg, & Haavik, 2009; van de Glind et al., 2014). Possibly, the havoc caused by SUD comorbidity might have delayed the ADHD assessment in these individuals, as discussed by Løvaas and Dahl (2013).

Strengths and Limitations

One of the strengths of this naturalistic exploratory study is that SUD patients with an ADHD diagnosis were naturally encountered during the recruitment process in SUD treatment. Assessment and clinical diagnosis of ADHD were in accordance with the Norwegian diagnostic guidelines for ADHD. The majority of instruments used had an acceptable to excellent reliability. By addressing personality and readiness to change in the field of SUD and ADHD, this study contributes with additional knowledge of an otherwise little explored area. There are some limitations in this study: (a) the relatively small sample sizes which limit representativity and the underrepresentation of women in the SUD + ADHD group; (b) findings based on $p < .05$ increase the risk of false positive inferences; (c) the impact of psychopharmacological treatment, crucial to improve ADHD symptomatology in SUD + ADHD patients was out of the scope of this study; (d) the multiple SOCRATES scales per patient can have compromised our findings on readiness to change; (e) our findings may be biased because they might represent SUD + ADHD patients with a better mental health than those commonly presented in the literature; (f) only current substance dependence diagnostic criteria were applied. Similarly, only current (no lifetime) Axis I diagnoses were considered when full symptom criteria were met. (g) Finally, this study was conducted before the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*; APA, 2013) was introduced. Possibly, *DSM-5* diagnostic criteria could have resulted in a different prevalence of psychopathology.

Clinical Implications

This study indicates that SUD + ADHD patients benefit from understanding how or whether their substance use is related to their personality styles. Moreover, by openly discussing readiness to change, SUD + ADHD patients may be in a better position to make intentional changes in relation to their substance use problems. However, due to the executive dysfunctions in ADHD, such discussion might be more demanding for both patients and clinicians. SUD + ADHD patients may further benefit from breaking down their treatment goals into smaller and realistic goals, incorporating frequent rewards to SUD treatment and focusing on the prevention of high risk situations for substance use. By encouraging self-awareness and the active involvement in SUD treatment, these patients might grow in self-directedness and cooperativeness, maturity, and well-being.

Acknowledgements

We thank all patients who participated in this study and the staff of the units ReStart and Færingen for their organizational support. We also thank Mar Buitron who provided language revision and Trond N. Bjerke for his comments on the manuscript.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The present study received research grants from Northern Norway Regional Health Authority (Helse Nord RHF), research grants 3925/RUS983-10.

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Author Biographies

L. Flores-García is a substance use disorders counselor at the addiction unit ReStart, University Hospital of Northern Norway and a research fellow at the Department of Psychology, UiT The Arctic University of Norway. Her research interests are in the treatment of adult substance use disorders and comorbid ADHD.

E. Ytterstad is an associate professor in statistics at the Department of Mathematics and Statistics, UiT The Arctic University of Norway. Her research interest is mainly in applied statistics, where she has coauthored within medical sciences, fishery, linguistics, and psychology.

M. B. Lensing, PhD, is a senior advisor at NevSom–Norwegian Centre of Expertise for Neurodevelopmental Disorders and Hypersomnias at Oslo University Hospital. His main research interest is in neurodevelopmental disorders, particularly ADHD and autism spectrum disorders.

M. Eisemann is a professor at the Department of Psychology, UiT The Arctic University of Norway. His research interests are, among others, personality psychology and vulnerability models of psychopathology.