


Patients With Autism Spectrum Disorder and Co-occurring Substance Use Disorder: A Clinical Intervention Study

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ABSTRACT

BACKGROUND: The prevalence of substance use disorders (SUD) in individuals with autism spectrum disorders (ASD) appears to be higher than previously described. Attention has been drawn to developing new treatment approaches for this patient population, as they appear to do less well with traditional addiction treatment. There is very little research addressing treatment outcome. This study aims to introduce and evaluate a manualized group treatment intervention developed specifically for patients with ASD and co-occurring SUD.

METHODS: We developed a group treatment based on cognitive behavioural therapy (CBT) and evaluated outcome measures at the end of treatment and 3-month follow-up. Fifty-seven patients with ASD and co-occurring SUD were included of which 30 completed the group intervention, 27 of them also participated at 3-month follow-up.

RESULTS: The findings suggest that group treatment can work for patients with ASD and co-occurring SUD. Lower levels of alcohol use ($t=3.61$, $P=.002$, $d=0.75$), craving ($t=2.65$, $P=.013$, $d=0.51$), passive coping styles ($t=2.32$, $P=.030$, $d=0.48$), depression ($t=3.48$, $P=.002$, $d=0.67$), anxiety ($t=3.02$, $P=.006$, $d=0.58$), and stress ($t=2.62$, $P=.015$, $d=0.51$) symptoms were reported after completing the group intervention, with even stronger effects at 3 months follow-up.

CONCLUSIONS: The present study shows promising results of a tailor-made group intervention in a heterogeneous patient population with ASD and co-occurring SUD with positive effects on both symptoms of ASD and SUD.

KEYWORDS: Autism spectrum disorder, substance use disorder, group treatment, cognitive behavioural therapy

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Autism spectrum disorder (ASD) and co-occurring substance use disorder (SUD) have received little attention in the literature to date. Little is known about the prevalence of SUD among individuals with ASD, the function of substance use and effective intervention strategies. A recent review¹ stressed the importance of developing tailor-made interventions for this patient population.

The prevalence of SUD in patients with ASD has been found to range from 0.7% to 36%, depending on sample characteristics and the definition of SUD.¹ While earlier research suggested lower prevalence rates of SUD in ASD populations when compared to a general population, a Swedish population-based cohort study ($n=26,986$) found a relatively high prevalence of substance use related problems.² This study used a slightly broader definition including convictions for substance related criminal offences, substance related death and alcohol-related somatic disease. The risk of substance related problems in patients with ASD was almost twofold, compared to matched non-ASD controls. Comorbid ADHD increased this risk further, while intellectual disability was associated with a lower risk of substance use problems. Contrary to earlier hypotheses that ASD could be a protective factor against the

development of SUD due to a limited social network and social activities which are linked to alcohol and drug use^{2,3} concluded that ASD is a risk factor for substance use-related problems.

Which subgroups of patients are particularly at risk for developing SUD? Apart from co-occurring ADHD, it is postulated that the high comorbidity with anxiety and other psychiatric disorders presents a risk factor for the development of substance use related problems in patients with ASD.¹ The high functioning group of patients with ASD will be more likely to engage in social activities and may use alcohol or drugs as a coping strategy or a form of self-medication to reduce social anxiety and increase their social skills.^{1,4,5} Patients with ASD and co-occurring SUD describe various functions of their substance use: it helps to temporarily forget problems, to clear the mind, to cope with social difficulties, to fill spare time or 'empty days', to deal with frustration/stress and to reduce anxiety and depression.^{1,6}

What are the consequences of substance use for individuals with ASD? Commonly, SUDs have a negative impact on quality of life as they are responsible for a high rate of accidents, mental health problems, premature death, violence and suicide (attempts). For individuals with ASD, substance use tends to



have a profound impact on their functioning, as it dysregulates daily routines. This in turn can trigger further substance use, thereby leading to a vicious circle of increasing substance use and related stress.¹ In addition, intoxication will have a negative impact on the ability to anticipate the consequences of their behaviour and act accordingly. Sizoo et al⁴ describe similar problems with executive functioning, leading to a loss of active coping and problem solving skills. Kronenberg, Verkerk-Taminga, Goossens, Van den Brink and Van Achterberg⁷ have studied the nursing needs of patients with ASD and SUD and conclude that these are higher compared to patients with ADHD and SUD or other comorbidity in SUD. Extended nursing needs were related to mental health problems, unemployment, financial problems, daytime activities, family/social relations, housekeeping and sexual functioning.

Concerning treatment approaches, Arnevik and Helverschou¹ conclude that, given the paucity of intervention studies, it is necessary for clinicians treating patients with ASD and SUD to rely on clinical expertise and separate guidelines for each of the 2 disorders. Given the difficulties many patients with ASD experience in social situations, these authors expect an individual approach to be more effective compared to a group intervention. The following elements are proposed to be promising in the development of effective interventions for patients with ASD and SUD: an educational and directive attitude, a cognitive-behavioural approach adjusted to the individual's level of functioning and engaging the support of family and friends. In order to enhance motivation for change and to achieve individual treatment goals, therapy should make use of incentives for abstinence, trying to replace substance use with more rewarding activities and facilitating interpersonal relationships. The therapy should also improve problem-solving skills and teach patients to refuse and resist substances in case of craving. Individual therapy should be offered in combination with medical and psychosocial interventions, consisting of supported housing, education, transportation and legal advice.

As far as we know, the study by Helverschou et al⁶ was the first to explore a specific treatment strategy for patients with ASD and co-occurring SUD. The study evaluates the individualized treatment of 4 patients, consisting of cognitive behavioural therapy (CBT) with a minimum of 10 sessions and situated in regular SUD outpatient clinics. The content of the CBT sessions was adjusted to specific communication and comprehension difficulties that are characteristic for individuals with ASD and aimed to address specific themes of interest. The focus was on teaching new strategies for self-monitoring and coping. No specific manuals were used. The therapists selected interventions from various available CBT-manuals and adjusted them to the needs of the individual patient. Treatment components included psycho-education, cognitive restructuring, relaxation techniques, exposure and response prevention. The authors conclude that treatment requires knowledge of and experience with ASD. The intervention was more time-consuming and challenging compared to non-ASD

patients, mainly due to the need to adjust to the patients' communication style and ASD characteristics. The therapists required support to learn how to structure sessions effectively, to maintain motivation despite an apparent lack of success and to integrate psycho-education with the CBT approach.

While there is growing attention for adults with higher functioning ASD within specialized mental health services, the focus on co-occurring SUD is increasing as well. As more patients with ASD present for treatment at specialized addiction centres, there is a need to develop and evaluate effective interventions for this population. Although Arnevik et al¹ stressed the importance of an individualized approach, it is important to know whether the treatment elements described earlier could be integrated within a group intervention. The current study presents a CBT based group intervention for patients with ASD and co-occurring SUD, which can be part of a comprehensive treatment package or can be offered as a 'stand-alone' intervention. This study aims to introduce and evaluate this manualized group intervention, by evaluating different outcome measures. Outcome measures were current drug and alcohol use, coping strategies and patients experience of control over their alcohol and drug use and experience of recovery. It was hypothesized that patients, after group treatment, (1) reduced their alcohol and drug use or remained stable, (2) experienced less craving, (3) made a switch from passive coping styles to active coping style, (4) experienced more control over their life, (5) ruminated less and (6) experienced less symptoms of depression, anxiety and stress.

Methods

Participants

A total of 57 patients participated in the study and were referred to Novadic-Kentron by their general practitioner for treatment for their drug- or alcohol use problems. Novadic-Kentron, Network for addiction care, is an addiction treatment centre, situated in the province of Brabant (2.495.107 inhabitants [2015]) in the south of the Netherlands. Some of the patients had received addiction treatment at Novadic-Kentron earlier, while others were in care at psychiatric services specialized in ASD. Following the assessment procedure, patients were assigned to join the group treatment intervention if they met the following inclusion criteria: (1) previous diagnosis of ASD according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition⁸; (2) diagnosed with a SUD according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition⁸; (3) aged over 18 years; and, (4) able to attend weekly outpatient sessions. Exclusion criteria were low intellectual disability (IQ-scores below 80), psychiatric comorbidity (eg, psychosis) or a very recent diagnosis of ASD (meaning that people are still 'fighting against the diagnosis').

Prior to the start of the group treatment, all patients gave their informed written informed consent for the research

evaluation of their treatment. All 57 participants completed the assessment prior to the start of the intervention (T0). Thirty participants completed the intervention and first follow-up (T1). Twenty-seven participants completed the second follow-up at 3 months after treatment (T2). Inclusion took place from August 2017 to August 2019. Demographic and substance use characteristics of the sample at T0, T1 and T2 are described in Table 1. Differences between participants and dropouts were explored and they do not differ significantly from each other at the 0.05 level in none of the socio-demographic characteristics. Nevertheless, it needs to be noticed that although the significance level was not reached, the dropouts between T0 and T1 were younger than the participants. Reasons given for dropout at T1 and T2 were: sensory overload during group sessions, increased craving due to discussing substance use during the group sessions, autism-related stress in other areas of patients' lives such as work, family or housing. No differences were found between

Pre- and post-treatment assessment

A naturalistic pre-post treatment study was conducted. The assessment and assigning procedures were carried out under naturalistic, clinical conditions. All data were anonymized prior to analysis. The following instruments were used at T0, T1 and T2.

Instruments

Measurement of addiction for triage and evaluation (MATE 2.1). Substance use or non-substance behaviour over the past 30 days was measured using a section of the MATE 2.1 (MATE 1), in combination with the MATE Q1, which assesses the degree of craving. The MATE Q1 is based on the Obsessive Compulsive Drinking Scale⁹ (OCDS). The MATE 2.1 is part of the standard assessment procedure at Novadic-Kentron and is widely used in the Netherlands. The instrument can be used to assess the severity of addiction and psychiatric comorbidity, the social functioning and treatment history. It is routinely used for assessing care needs and evaluating treatment.¹⁰

The Utrecht Coping List (UCL). The UCL is a self-report measure, assessing different dimensions of coping one uses when encountering daily life struggles.¹¹ The UCL consists of 47 items, which are scored on a 4-point Likert scale, from 'Almost never' to 'Almost always'. The instrument consists of 7 subscales: (1) Active problem solving (ACT), (2) Palliative reaction (PAL), (3) Avoidance (VER), (4) Socialization (SOC), (5) Passive reaction (PAS), (6) Expression emotions (EXP) and (7) Reassuring thoughts (GER). The validity is generally acceptable, with Cronbach's α ranging from .43 to .89 for the different scales.¹¹

The Mental Health Recovery Measure (MHRM). The MHRM¹² (Dutch Version¹³) is a self-report instrument, which measures the patients' recovery process. It consists of 3 scales, with 30 items. All items are scored on a 5-point Likert scale, from 'Strongly disagree' to 'Strongly agree'. An example item is 'I have control over my life'. The validity was measured per scale, all resulting in a good validity: Self-Empowerment (13 items, Cronbach's α : 0.90, 'I feel good about myself'), Learning and New-potentials (15 items, Cronbach's α : 0.86, 'Everyday offers a new opportunity to learn') and Spirituality (2 items, Cronbach's α : 0.94, 'My religion or spirituality helps me in my recovery process').¹³

The Rumination Reflection Questionnaire (RRQ). The RRQ¹⁴ (Dutch version¹⁵) measures the extent to which a patient generally ruminates or reflects. Only the items measuring the tendency to ruminate are used in this research. The rumination scale consists of 12 items on a 5 point Likert scale, from 'Strongly disagree' to 'Strongly agree'. A total score is calculated, after scoring 3 items reversely. An example item is 'I tend to ruminate or dwell over things that happen to me for a really long time afterwards'. In both the original and the Dutch version of the RRQ, the rumination scale has a high validity, with a Cronbach's alpha of .90.^{14,15}

The Depression Anxiety Stress Scales (DASS-21). The DASS-21 is a self-report questionnaire, measuring symptoms of depression, anxiety and stress¹⁶ (Dutch version¹⁷). The short form of the DASS (DASS-21) is included in the MATE 2.1, with 21 items instead of the original 42 items. Patients are asked to rate the extent to which they experienced each item during the past week. All items are scored on a 4-point Likert scale, ranging from 'Not at all' to 'Absolutely'. An example item is 'I was very nervous'. The validity of the DASS-21 is good, with Cronbach's α ranging from .89 to .94 for the different scales.¹⁷

Interventions

The intervention consists of an adaptation of CBT for SUD.^{18,19} Components such as psychoeducation, response prevention and cognitive restructuring were tailored to the needs of patients with ASD with a co-occurring SUD. Given the communication difficulties many patients with ASD experience, the regular CBT treatment is not always the most suitable treatment of choice. The adapted version of the CBT group intervention aims to increase the sense of control patients with ASD and SUD experience over their daily life. The aim is to change dysfunctional beliefs and coping strategies. At the start of the intervention, patients are encouraged to choose a 'buddy'. The 'buddy' can be a friend, family member or professional with whom they can share their experience of the group treatment, thereby enhancing generalization to their daily life. The group intervention consisted of 12 sessions, all with a duration

Table 1. Sociodemographic characteristics of the sample at T⁰, T¹ and T².

CHARACTERISTICS	T0 N=57 (%)	T1 N=30 (%)	T2 N=27 (%)
Gender			
Male	49 (86.0)	26 (86.7)	23 (85.2)
Female	8 (14.0)	4 (13.3)	4 (14.8)
Age			
Mean (SD)	36.77 (11.65)	41.10 (12.84)	40.85 (13.34)
Minimum	19	24	24
Maximum	64	64	64
Country of Birth			
The Netherlands	53 (93.0)	29 (96.7)	26 (96.3)
Other			
<i>European</i>	2 (3.5)	1 (3.3)	1 (3.7)
<i>Non-European</i>	2 (3.5)	–	–
Education level			
Low	19 (33.3)	10 (33.3)	9 (33.3)
Medium	25 (43.9)	9 (30.0)	8 (29.6)
High	12 (21.1)	10 (33.3)	9 (33.3)
Missing	1	1	1
Primary source of income			
Job/student loan	14 (24.6)	9 (30.0)	8 (29.6)
Unemployed/social benefit	43 (75.4)	21 (70.0)	19 (70.4)
Marital status			
Married	10 (17.5)	7 (23.3)	7 (25.9)
Single	41 (71.9)	20 (66.7)	17 (63.0)
Divorced/widow/widower	6 (10.5)	3 (10.0)	3 (11.1)
Primary (non)-substance use disorder			
Alcohol	24 (42.1)	17 (56.7)	15 (55.6)
Cocaine	5 (8.8)	–	–
Cannabis	17 (29.8)	8 (26.7)	8 (29.6)
Amphetamine	3 (5.3)	1 (3.3)	–
Ecstasy	1 (1.8)	–	–
GHB	1 (1.8)	1 (3.3)	1 (3.7)
Medication	1 (1.8)	–	–
Gambling	4 (7.0)	2 (6.7)	2 (7.4)
Other	1 (1.8)	1 (3.3)	1 (3.7)

(Continued)

Table 1. (Continued)

CHARACTERISTICS	T0 N = 57 (%)	T1 N = 30 (%)	T2 N = 27 (%)
Secondary (non)-substance use disorder			
Alcohol	4 (7.0)	2 (6.7)	2 (7.4)
Cannabis	5 (8.8)	2 (6.7)	2 (7.4)
Gambling	4 (7.0)	2 (6.7)	2 (7.4)
None	44 (77.2)	24 (80.0)	21 (77.8)
Treatment buddy			
Yes	44 (77.2)	24 (80.0)	23 (85.2)
No	13 (22.9)	6 (20.0)	4 (14.8)
Treatment attendance			
Mean (%)	86	90	91

of 2 hours. The manualized intervention is described by Bosma and van Zanten²⁰ and consists of the following elements: pros and cons of substance use to enhance motivation for behavioural change; patients individual goals with respect to changing substance use; registration and reflection on situations that trigger substance use (recognizing patterns in substance use); psycho-education on possible connections between substance use and general or autism related stress; reflecting on possible functions of substance use for coping with autism related stress; specific self-control methods to avoid risk-situations, reduce substance use and cope with craving; cognitive and behavioural techniques to make use of 'helping thoughts' and to say 'no' when substances are offered; recognizing and coping with autism related stress such as sensory overload, making use of free time, adapting to new situations, stressful social interactions and accepting one's own autistic characteristics. The first 6 sessions are offered to all groups while the remaining sessions can be chosen according to specific problem areas of individual group members. Based on experience, the most important elements of the group intervention seem to be the interaction between the patients, sharing experiences, learning how to recognize and identify individual sources of stress and visualizing the progress patients' make. All therapists are employed at Novadic-Kentron, Network for Addiction Treatment Services, are experienced in working with patients with ASD and co-occurring SUD and were involved in the development and implementation of the current study. Therapist style is characterized by a not-knowing stance and collaboration, exploring the specific relation between substance use and autism-related stress for each individual patient and aiming for individualized problem solving strategies within the group.²¹ The group intervention is led by 2 therapists who are experienced in cognitive behavioural therapy and of which at least 1 is a healthcare

psychologist. A supportive and authentic therapeutic attitude is encouraged. During the group sessions, patients were not under the influence of alcohol and/or drugs. Substance use in between sessions is not a contra indication.

Analysis

Descriptive statistics were performed on demographic variables. Multiple paired *t*-tests were conducted to compare the variables at different points in time (T⁰, T¹ and T²). The paired *t*-tests assumed equal variance between groups. The assumption of normal distribution was checked and no deviations were found. Results were found to be significant at $P < .05$. Moreover, the standardized effect sizes (Cohen's *d*) were calculated, to measure the magnitude of significant effects. Data were analyzed using the Statistical Package for the Social Sciences (IBM SPSS Statistics, version 26).

Results

Study population

The mean age of the study population at assessment (T⁰, N = 57) was 36.8 (SD 11.65) years, 86% of them were male (see Table 1). Most of the participants were born in the Netherlands (93.0%). All education levels were found within the population, most of them had medium levels of education (43.9%). 75.4% of the population received unemployment or social security benefits and 71.9% of them had never been married. Substances most used were alcohol (42.1%), cannabis (29.8%) and cocaine (8.8%). Most of the participants had only 1 SUD diagnosis (77.2%). In terms of demographics and clinical characteristics there were no significant differences between participants at T⁰, T¹ and T² (see Table 1). Our study population did not differ significantly from comparable populations in autism research.⁴

Table 2. Comparisons of the variables between baseline (T⁰) and after completion (T¹).

VARIABLES	T ⁰ MEAN (SD)	T ¹ MEAN	(SD)	T TEST	EFFECT SIZE (D)
MATE 2.1					
Primary subs. Alcohol	16.35 (11.2)	0.30	(9.16)	3.611**	0.75
Primary subs. Cannabis	23.20 (11.29)	17.10	(14.04)	1.162	0.37
Craving	8.07 (4.60)	5.74	(4.55)	2.651*	0.51
UCL					
Coping – ACT	16.30 (3.98)	17.04	(3.74)	–0.827	0.17
Coping – PAL	19.57 (3.07)	18.70	(2.79)	1.335	0.27
Coping – VER	18.30 (3.81)	18.17	(3.03)	0.179	0.03
Coping – SOC	11.83 (3.10)	13.26	(3.44)	–2.296*	–0.48
Coping – PAS	18.04 (4.54)	15.91	(4.59)	2.315*	0.48
Coping – EXP	6.26 (1.94)	6.39	(2.17)	–0.282	–0.06
Coping – GER	10.26 (2.53)	11.04	(2.71)	–1.621	–0.34
MHRM					
Total score	90.14 (12.67)	102.64	(21.35)	–2.814*	–0.60
Self-empowerment	38.26 (8.30)	44.74	(11.28)	–3.096**	–0.65
Learning/New Potential	49.00 (6.36)	51.96	(14.55)	–0.982	–0.19
Spirituality	4.63 (2.12)	4.70	(2.30)	–0.189	–0.04
RRQ					
Rumination	39.04 (5.53)	38.00	(6.62)	0.940	0.20
DASS-21					
Depression	16.00 (11.33)	8.15	(9.69)	3.479**	0.67
Anxiety	9.26 (7.49)	5.11	(6.31)	3.017*	0.58
Stress	15.31 (10.70)	10.27	(7.45)	2.617*	0.51
Total DASS-score	40.23 (25.63)	23.96	(19.27)	3.389**	0.66

*Significance level; * $P < .05$; ** $P < .01$; *** $P < .001$.

Table 3. Comparisons of the variables between baseline (T⁰) and 3 months after completion (T²).

VARIABLES	T ⁰ MEAN (SD)	T ² MEAN (SD)	(SD)	T TEST	EFFECT SIZE (D)
MATE 2.1					
Primary subs. Alcohol	15.86 (11.66)	5.86 (5.76)		4.636***	1.01
Primary subs. Cannabis	20.20 (13.12)	11.50 (13.63)		1.843	0.58
Craving	8.58 (4.52)	5.25 (4.77)		3.254**	0.66
UCL					
Coping – ACT	15.96 (4.00)	17.40 (3.91)		-1.705	-0.34
Coping – PAL	19.28 (3.22)	18.76 (2.39)		0.738	0.15
Coping – VER	18.25 (3.73)	17.50 (2.78)		0.811	0.17
Coping – SOC	11.44 (3.27)	13.28 (4.37)		-2.432*	-0.49
Coping – PAS	18.08 (4.29)	14.46 (3.86)		3.613***	0.74
Coping – EXP	6.16 (1.89)	5.52 (1.83)		1.619	0.32
Coping – GER	10.32 (2.50)	11.76 (2.62)		-2.410*	-0.48
MHRM					
Total score	92.60 (14.66)	107.00 (17.93)		-3.886***	-0.78
Self-empowerment	38.60 (7.54)	46.08 (9.78)		-3.983***	-0.80
Learning/New Potential	49.40 (7.27)	55.24 (7.90)		-3.115**	-0.62
Spirituality	4.60 (2.18)	5.68 (2.19)		-2.397*	-0.48
RRQ					
Rumination	39.08 (5.58)	37.84 (7.86)		0.868	0.17
DASS-21					
Depression	16.58 (11.73)	8.08 (9.68)		3.503**	0.72
Anxiety	8.58 (7.59)	2.75 (3.05)		3.612***	0.74
Stress	14.78 (10.95)	9.04 (6.60)		2.493*	0.52
Total DASS-score	39.57 (27.20)	19.30 (16.78)		3.404**	0.71

*Significance level; * $P < .05$. ** $P < .01$. *** $P < .001$.

T⁰ versus T¹

The first paired t -test was conducted to compare the mean scores of the different outcome variables before starting the treatment (T⁰) and after completion (T¹). Mean scores and results of the paired t -test are depicted in Table 2. Compared with the start of the treatment, patients showed a significant decrease of reported: levels of alcohol consumption (during past 30 days, $t [22]=3.611$, $P=.002$, $d=0.75$), craving ($t [26]=2.651$, $P=.013$, $d=0.51$) and passive coping style ($t [22]=2.315$, $P=.030$, $d=0.48$); an increase in seeking social support as a coping style ($t [22]=-2.296$, $P=0.032$, $d=-0.48$), overall feeling of control ($t [21]=-2.814$, $P=.010$, $d=-.60$) and self-empowerment ($t [22]=-3.096$, $P=.005$, $d=-0.65$); and a

decrease of reported depression ($t [26]=3.479$, $P=.002$, $d=0.67$), anxiety ($t [26]=3.017$, $P=.006$, $d=0.58$) and stress ($t [25]=2.617$, $P=.015$, $d=0.51$) after they completed the treatment. There were no significant changes before and after treatment, in the levels of cannabis consumption during the past 30 days, other coping styles (see Table 2 for specific coping styles) and rumination.

T⁰ versus T²

A paired t -test was used to compare the mean scores before starting the treatment (T⁰) and at 3 months follow-up (T²). Mean scores and results of the paired t -test are depicted in Table 3. Compared to the start of the treatment, patients

reported a significant decrease in: levels of alcohol consumption (during past 30 days, $t [20] = 4.636, P = .000, d = 1.01$), craving ($t [23] = 3.254, P = .003, d = .66$), and passive coping style ($t [23] = 3.613, P = .001, d = .74$); an increase in seeking social support as a coping style ($t [24] = -2.432, P = .023, d = -.49$), using reassuring thoughts ($t [24] = -2.410, P = .024, d = -0.48$), overall feeling of control ($t [24] = -3.886, P = .001, d = -0.78$), self-empowerment ($t [24] = -3.983, P = .001, d = -0.80$), learning and new potentials ($t [24] = -3.115, P = .005, d = -0.62$) and spirituality ($t [24] = -2.397, P = .025, d = -0.48$); and a decrease of reported depression ($t [23] = 3.503, P = .002, d = 0.72$), anxiety ($t [23] = 3.612, P = .001, d = 0.74$) and stress level ($t [22] = 2.493, P = .021, d = 0.52$). There were no significant changes during the follow-up period, in the levels of cannabis consumption during the past 30 days, other coping styles (see Table 2 for specific coping styles) and rumination.

Discussion

To our knowledge, this is the first group intervention study in patients with ASD and co-occurring SUD. The findings suggest a positive outcome of the described group intervention. Participants reported lower levels of alcohol use and craving after completing the group intervention, this effect was even stronger 3 months after completion. They also reported a change in using social support as a coping style and made less use of a passive coping style. A passive coping style reflects the tendency to get completely absorbed by problems or situations and not doing anything to solve them. Participants felt they had more control over their recovery process and reported fewer symptoms of depression, anxiety and stress symptoms after completion. These results were also found at 3 months follow-up. However, 27 of the 57 participants initially referred to the study dropped out. This is comparable to SUD treatment in general, where the dropout rate is more than 50%.²² Based on the positive experience of our participants, it is recommended to include a 'buddy' during treatment, because this can improve the generalizability of the learned skills during the group intervention in daily life. Contrary to our expectations, participants did not report lower levels of rumination. It is possible that rumination is a core element of ASD and thus not prone to change. However, Spek et al²³ found in a randomized controlled trial a significant reduction of rumination in an intervention group of mindfulness-based group therapy for adults with an autism spectrum disorder. The lack of positive results on rumination in our study can possibly be explained by the less intensive use of mindfulness during our group intervention. Our group intervention only applied 2 exercises, instead of a full training as was used by Spek.²³ The aim of the group intervention is not to ensure that patients are proficient in mindfulness, it serves as an introduction to mindfulness as a way of coping with stress caused by ASD and/or SUD. Another interesting finding of our study is that the alcohol use of clients decreases significantly after the group intervention, while the use of cannabis remains unchanged. A potential explanation for this fact may have to do

with the different functions these substances have for patients with ASD. Cannabis is mainly used to calm internal symptoms such as rumination, whereas alcohol is often used in order to participate in social situations. As our intervention specifically focusses on improving social skills and accepting one's own limitations in social situations, patients may find alcohol use less necessary. Core symptoms of ASD such as rumination and internal chaos were briefly mentioned in the group sessions, but receive less attention compared to topics of social skills. Further research is needed to test these hypotheses.

Limitations

The results of this naturalistic pre-post intervention study should be interpreted with caution, as our sample size was quite small ($N = 57$) and we did not include a control group. The study population was heterogeneous in terms of the time between the first diagnosis of ASD and the start of the intervention, which might have influenced the results. Therefore, the overall positive effects on the level of substance use and the sense of control over their own life need to be further explored and replicated. The group format appears to be well received by patients with ASD and SUD and feasible in an outpatient treatment setting. Furthermore, we propose to study the applicability of this tailor-made manualized treatment also as an individual intervention. We aim to gain more insight into a correct assessment of assigning patients to either an individual intervention, or a group intervention. By studying the applicability as an individual intervention, we hope to gain more clarity about possible effects of the applicability of an individual approach. Moreover, it is interesting to study the effects of including a 'buddy' during the intervention, because we expect this element to affect the generalizability of learned skills to daily life. Nevertheless, it could be concluded that the present study shows that this group intervention has positive results in a heterogeneous patient population with ASD and SUD. Based on the results of this study, the tailor-made manualized group treatment will be reviewed and adjusted.

Author contributions

SJNW, JZ and MB conceived and designed the study. SJNW and LDM analyzed the data. First draft manuscript written by SJNW, JZ, LDM, CKMES and MB. Revisions and final approval made by SJNW and LDM.

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