

Faculty of Health Sciences, Department of Psychology

**Substance Use Disorder patients with and without Attention Deficit Hyperactivity**

**Disorder: Exploring differences in personality, substance use-related aspects and quality of life in a naturalistic follow-up study**

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## **Abbreviations**

AA	Alcoholics Anonymous
APA	American Psychiatric Association
ADD	Attention deficit disorder
ADHD	Attention deficit hyperactivity disorder
AUD(s)	Alcohol use disorder(s)
AUDIT	Alcohol Use Disorders Identification test
ASRS	Adult ADHD Self-Report Scale
B.C.	Before Christ
CS(s)	Central stimulant(s)
DUDIT	Drug Use Disorders Identification Test
DSM-I	Diagnostic and Statistical Manual, 1 <sup>st</sup> edition
DSM-II	Diagnostic and Statistical Manual of Mental Disorders, 2 <sup>nd</sup> edition
DSM-III	Diagnostic and Statistical Manual of Mental Disorders, 3 <sup>rd</sup> edition
DSM-III-R	Diagnostic and Statistical Manual of Mental Disorders, 3 <sup>rd</sup> edition revised
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, 4 <sup>th</sup> edition
DSM-IV-TR	Diagnostic and Statistical Manual of Mental Disorders, 4 <sup>th</sup> edition, text revised
DSM-5	Diagnostic and Statistical Manual of Mental Disorders, 5 <sup>th</sup> edition
ICD-9	The Classification of Mental and Behavioural Disorders, 9 <sup>th</sup> revision
ICD-10	The Classification of Mental and Behavioural Disorders, 10 <sup>th</sup> revision
M.I.N.I-PLUS	Mini International Neuropsychiatric Interview
NA	Narcotics Anonymous
NPS	National/Norwegian population sample

QoL	Quality of life
SCID II	Structural Clinical Interview for DSM-IV
SOCRATES	The Stages of Change Readiness and Treatment Eagerness Scale
SU	Substance use
SUD(s)	Substance use disorder(s)
SUD+ADHD	Patients with substance use disorder and ADHD
SUD-ADHD	Patients with substance use disorder without ADHD
TAU	Treatment as usual
TCI	Temperament and Character Inventory
WHO	World Health Organization
WHOQoL-BREF	World Health Organization Quality of Life questionnaire, short version



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## **Preface**

In Norway, individuals with substance use disorders (SUD) were first granted rights to receive SUD treatment in the specialized health care system in 2004. On the other hand, the awareness of adult ADHD has increased in Norway since the late 1990s. However, the awareness of the relationship between SUD and adult ADHD is relatively recent. In the last decade, several international studies, including Norwegian, have provided substantially valuable scientific knowledge on SUD+ADHD, e.g., the viability of screening, diagnosing and treating adult ADHD in SUD patients. I began working with SUD treatment in 2006. Eventually, my colleagues and I noticed that ADHD was fairly frequent among individuals receiving SUD treatment. Furthermore, we noticed that the course of SUD treatment was more challenging for those with ADHD than for those without. The present study was motivated with the purpose of acquiring scientific knowledge on SUD+ADHD patients. In the future, the goal will be to use our findings to adequate SUD treatment in line with our patients' needs.

In the present study, SUD patients with and without an ADHD diagnosis were investigated in light of factors which may be relevant in the context of SUD treatment. There are a number of points to notice before reading the present doctoral dissertation. Firstly, the assessment, diagnosis and type of treatment of ADHD in SUD patients are beyond the scope of the present study. Consequently, the diagnostic criteria of ADHD and the latest updates on the diagnosis of SUD and ADHD are not provided in detail in this dissertation. Instead, these are briefly discussed when considered as appropriate. Secondly, since this study was developed in 2010, the introduction is based on relevant research up to that date. However, relevant research after 2010 is integrated in the discussion.

**Substance Use Disorder patients with and without Attention Deficit Hyperactivity Disorder: Exploring differences in personality, substance use-related aspects and quality of life in a naturalistic follow-up study**

**Abstract**

**Background.** It is estimated that about 15% of adults seeking substance use disorder (SUD) treatment also have Attention Deficit Hyperactivity Disorder (ADHD). SUD+ADHD patients often present more severe substance use (SU) and psychiatric comorbidity than SUD-ADHD patients, implying that SUD+ADHD patients are more difficult to treat. Research on SUD+ADHD has mostly focused on the reduction of ADHD and SUD symptoms, whereas there is limited research on other relevant factors in the context of SUD treatment.

**Aims.** The overall aim of this naturalistic prospective study was to compare SUD+ADHD patients with SUD-ADHD patients on personality, SU-related aspects (i.e., readiness to change SU, positive and negative aspects of SU, and treatment goals) and quality of life (QoL). **Materials and Methods.** Patients consecutively entering SUD treatment between 2010 and 2012 were assessed at baseline and followed-up 12 months after SUD treatment. Personality was measured by the Temperament and Character Inventory (TCI). SU-related aspects were investigated by the Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES) and with qualitative interviews on positive and negative aspects of SU and treatment goals. QoL was measured by the World Health Organization Quality of Life questionnaire, short version (WHOQoL-BREF) and compared with QoL data from a Norwegian population sample (NPS). Substance use was measured by the Alcohol Use Disorder Identification Test (AUDIT) and the Drug Use Disorder Identification Test (DUDIT). ADHD symptoms were measured by the Adult ADHD Rating Scale (ASRS). Psychiatric comorbidity was assessed by the Mini International Neuropsychiatric Interview (M.I.N.I.-PLUS) and the Structured Clinical Interview for DSM-IV (SCID II).

Results were considered statistically significant when  $p < .01$  and as tendencies when  $p < .05$ .

**Results.** The study sample consisted of 16 SUD+ADHD and 87 SUD-ADHD patients with a mean age of  $43.3 \pm 11.1$ . SUD+ADHD patients were younger, more frequently diagnosed with amphetamine SUD and reported a higher ADHD symptomatology than SUD-ADHD patients. Psychiatric comorbidity was less prevalent in SUD+ADHD patients compared to SUD-ADHD patients. On personality SUD+ADHD patients reported lower fear of uncertainty, higher eagerness to effort, ambition and self-forgetfulness, compared to SUD-ADHD patients. Regarding SU-related aspects, SUD+ADHD patients reported lower readiness to change. Additionally, SUD+ADHD patients more commonly perceived SU as positive, had more variable treatment goals and less frequently considered total abstinence compared to SUD-ADHD patients. Both SUD groups reported similarly low QoL at baseline compared to the NPS. Even though both SUD groups reported a reduced SU at follow-up, only SUD+ADHD patients reported an improved QoL, however not significantly different compared to SUD-ADHD patients or the NPS. Additionally, SUD+ADHD patients' ADHD symptoms improved at follow-up. **Conclusions.** SUD+ADHD patients differed from SUD-ADHD patients on personality, SU-related aspects and QoL. These results underline the importance of understanding how SUD+ADHD patients relate to their own SU. Our findings on QoL suggest that SU reduction only is insufficient to achieve a satisfactory QoL in SUD+/-ADHD patients. More studies are needed to confirm our findings and investigate what might contribute to a better QoL in SUD+/-ADHD patients. SUD+ADHD and SUD-ADHD patients may benefit from individualized treatment strategies.

**Pasienter med rusmiddelavhengighet med og uten ADHD-diagnose: En undersøkelse av forskjeller i personlighet, rusmiddelrelaterte aspekter og livskvalitet i en naturalistisk oppfølgingsstudie**

**Sammendrag**

**Bakgrunn.** Omtrent 15% av voksne personer med rusmiddelavhengighet (eng. SUD) som søker rusbehandling har også ADHD. SUD+ADHD pasienter viser ofte en alvorligere rusmiddelavhengighet enn SUD-ADHD pasienter og kan være vanskeligere å behandle. Forskning på SUD+ADHD har stort sett fokusert på reduksjon av ADHD og SUD symptomer, mens det er begrenset forskning i forhold til andre faktorer som kan være relevante i en rusbehandlingssammenheng. **Hensikten** med denne studien var å sammenligne SUD+ADHD pasienter med SUD-ADHD pasienter i forhold til faktorer som personlighet, rusmiddelbruksrelaterte aspekter som endringsvilje, positive og negative aspekter ved rusmiddelbruk og behandlingsmål, samt livskvalitet. **Materialer og metoder.** SUD pasienter med og uten ADHD-diagnose som fortløpende startet opp i rusbehandling mellom 2010 og 2012 ble kartlagt ved baseline og fulgt opp 12 måneder etter rusbehandling. Personlighet ble undersøkt med Temperament and Character Inventory (TCI). Rusmiddelbruksrelaterte aspekter ble undersøkt med Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES) og med kvalitative intervjuer om de positive og negative aspekter ved rusmiddelbruk og behandlingsmål. Livskvalitet ble undersøkt med World Health Organization Quality of Life questionnaire, short version (WHOQOL-BREF) og sammenlignet med livskvalitetsdata fra et norsk populasjonsutvalg (NPS). Rusmiddelbruk ble undersøkt med Alcohol Use Disorder Identification Test (AUDIT) og Drug Use Disorder Identification Test (DUDIT). ADHD symptomer ble undersøkt med Adult ADHD Rating Scale (ASRS). Psykiatrisk komorbiditet ble undersøkt med Mini International

Neuropsychiatric Interview (M.I.N.I.-PLUS) og med Structured Clinical Interview for DSM-IV (SCID II). Resultater ble ansett som statistisk signifikante når  $p < .01$  og som tendenser når  $p < .05$ . **Resultater.** Utvalget bestod av 16 SUD+ADHD og 87 SUD-ADHD pasienter (gjennomsnittsalder  $43.3 \pm 11.1$ ). SUD+ADHD pasienter var yngre, ble oftere diagnostisert med amfetaminavhengighet og rapporterte høyere ADHD symptomer enn SUD-ADHD pasienter. Forekomst av psykiatrisk komorbiditet var lavere hos SUD+ADHD pasienter sammenlignet med SUD-ADHD pasienter. I forhold til personlighet viste pasienter med SUD+ADHD lavere engstelse for det ukjente, høyere iver etter innsats, ambisjon og selvforglemmelse (eng. self-forgetfulness), sammenlignet med pasienter med SUD-ADHD. I forhold til rusmiddelbruksrelaterte aspekter, viste pasienter med SUD+ADHD lavere endringsvilje, oppfattet sitt rusmiddelbruk oftere som positivt og hadde mer varierende rusmiddelrelaterte behandlingsmål sammenlignet med SUD-ADHD pasienter. Begge gruppene rapporterte om lav livskvalitet ved baseline sammenlignet med en NPS. Tolv måneder etter rusmiddelbehandling var det kun SUD+ADHD pasienter som rapporterte forbedret livskvalitet, men ingen signifikant forskjell sammenlignet med SUD-ADHD pasienter eller NPS. Begge gruppene rapporterte lavere rusmiddelbruk og SUD+ADHD pasientene rapporterte lavere ADHD symptomer 12 måneder etter rusmiddelbehandling.

**Konklusjon.** Resultatene illustrerer at SUD+ADHD og SUD-ADHD pasienter har ulike personlighetsstiler. De ser ut til å forholde seg ulikt til sitt rusmiddelbruk og rapporterer forskjellig på livskvalitet. Funnene om livskvalitet påpeker at redusert rusmiddelbruk alene ikke er tilstrekkelige til å oppnå en tilfredsstillende livskvalitet blant pasienter med SUD+/-ADHD. Det er behov for flere studier for å bekrefte funnene og undersøke videre hva kan bidra til en forbedret livskvalitet hos pasienter med SUD+/-ADHD. Pasientene med SUD+ADHD og SUD-ADHD kan dra nytte av individualiserte behandlingstiltak.

# **Pacientes con trastorno por uso de sustancias con y sin trastorno por déficit de atención con hiperactividad: Explorando diferencias en personalidad, aspectos relacionados con el uso de sustancias y calidad de vida en un estudio naturalístico prospectivo**

## **Resumen**

**Marco teórico.** Aproximadamente el 15% de adultos que buscan tratamiento para el trastorno por abuso de sustancias (inglés SUD) presenta trastorno por déficit de atención con hiperactividad (inglés ADHD). Los pacientes con SUD+ADHD a menudo presentan un uso de sustancias (USUS) y comorbilidad psiquiátrica más graves que los pacientes con SUD-ADHD, lo cuál implica que los primeros son más difíciles de tratar. Estudios sobre SUD+ADHD se han centrado en la reducción de síntomas, mientras que estudios sobre otros factores relevantes en el contexto del tratamiento de SUD son escasos. **Objetivos.** El objetivo de este estudio naturalístico prospectivo fue comparar pacientes con SUD+ADHD vs SUD-ADHD en cuanto a personalidad, aspectos relacionados con USUS (preparación para el cambio, aspectos positivos y negativos de USUS y metas de tratamiento) y calidad de vida (CdV). **Materiales y métodos.** Los pacientes que ingresaron consecutivamente al tratamiento para SUD entre 2010 y 2012 fueron evaluados y se les dio seguimiento 12 meses después del tratamiento. La personalidad se midió mediante el Inventario de Temperamento y Caracter (TCI). Los aspectos relacionados con USUS fueron investigados con la escala de preparación para el cambio (SOCRATES) y con entrevistas cualitativas sobre los aspectos positivos y negativos del USUS y las metas de tratamiento. La CdV se midió mediante el cuestionario WHOQoL-BREF y se comparó con los datos de CdV de una muestra poblacional noruega (NPS). El consumo de sustancias se midió mediante las escalas de auto informe para uso de alcohol (AUDIT) y otras sustancias (DUDIT). Los síntomas de ADHD se midieron mediante la escala de auto informe ASRS. La comorbilidad psiquiátrica fue evaluada por M.I.N.I.-



PLUS y SCID II. Los resultados se consideraron estadísticamente significativos cuando  $p < .01$  y como tendencias cuando  $p < .05$ . **Resultados.** La muestra consistió en 16 pacientes con SUD+ADHD y 87 pacientes con SUD-ADHD con una edad media de  $43.3 \pm 11.1$ . Los pacientes SUD+ADHD fueron más jóvenes, con más frecuencia diagnosticados con SUD anfetamínico y reportaron una sintomatología de ADHD más alta que los pacientes SUD-ADHD. Se observó menos comorbilidad psiquiátrica en pacientes SUD+ADHD. Acerca de la personalidad, los pacientes con SUD+ADHD reportaron un menor temor a la incertidumbre, un mayor afán de esforzarse, ambición y olvido de sí mismos (self-fortgetfulness) en comparación con SUD-ADHD. Con respecto a los aspectos relacionados con el USUS, los pacientes con SUD+ADHD reportaron una menor preparación para el cambio. Además, con mayor frecuencia reportaron su USUS como positivo, reportaron objetivos de tratamiento más variables y consideraron con menor frecuencia abstinencia total a su USUS en comparación con los pacientes con SUD-ADHD. Ambos grupos reportaron una CdV igualmente baja al inicio del estudio con respecto al NPS. A pesar de que ambos grupos reportaron reducción en su USUS 12 meses después del tratamiento, sólo los pacientes SUD+ADHD reportaron una mejor CdV. Sin embargo, ésta no difirió significativamente con respecto a los pacientes con SUD-ADHD ó el NPS. Los síntomas de ADHD de los pacientes SUD+ADHD mejoraron en el seguimiento. **Conclusiones.** Los pacientes SUD+ADHD difirieron de los pacientes SUD-ADHD en cuanto a personalidad, aspectos relacionados con USUS y CdV. Estos resultados subrayan la importancia de comprender cómo los pacientes SUD+ADHD perciben su propio USUS. Nuestros hallazgos sobre la CdV sugieren que la reducción de USUS únicamente es insuficiente para lograr una CdV satisfactoria en pacientes con ADHD +/- ADHD. Más estudios son necesarios para confirmar nuestros resultados e investigar factores contribuyentes a la CdV en pacientes con ADHD +/- ADHD. Los pacientes con SUD+ADHD y SUD-ADHD podrían beneficiarse de estrategias de tratamiento individualizadas.

## List of papers

- I. Flores-Garcia, L., Ytterstad, E., Lensing, M. B., & Eisemann, M. (2016). Exploring Personality and Readiness to Change in Patients With Substance Use Disorders With and Without ADHD. *Journal of Attention Disorders*. doi:10.1177/1087054716677819
- II. Flores-García, L., Lensing, M. B., Bjerke, T. N., Kvalnes, M., & Eisemann, M. (2019). Positive and negative aspects of substance use and treatment goals among substance use disorder patients with and without attention deficit hyperactivity disorder: A qualitative study. *Cogent Psychology*, 6(1), 1682765. doi:10.1080/23311908.2019.1682765
- III. Flores L, Lensing MB, Ytterstad EY, Eisemann M. Quality of life in substance use disorder patients with and without attention deficit hyperactivity disorder 12 months after treatment: a naturalistic follow-up study. *ADHD Attention Deficit and Hyperactivity Disorders*. 2019; 11(3):299-310. doi:10.1007/s12402-019-00297-5

## **1. Introduction**

### **1.1. Substance use disorder (SUD)**

The SUD concept is described by the presence of physical, psychological and behavioral changes in the individual due to continued and uncontrolled substance use (SU) (American Psychiatric Association (APA), 1994, 2013; World Health Organization (WHO), 1992). An individual with SUDs may show symptoms of substance tolerance, withdrawal, loss of control over the initiation, amount and termination of SU (e.g., repeated attempts of quitting SU without success), strong cravings, and spend a substantial amount of time and resources in substance-related activities. The individual with a SUD may experience negative consequences in the physical, occupational (e.g., work, education leisure activities), familiar and social life domains, including legal problems (APA, 1994, 2013; WHO, 1992).

#### **1.1.1. The development of the concept of SUD**

The SUD concept has changed throughout history and as described below, it seems that most of the early observations of problematic SU started with alcohol. So far we know, the earliest descriptions of problematic alcohol use such as alcohol tolerance, inability to stop drinking, withdrawal and loss of control, were reported in the fifth century B.C. (White, Kurtz, & Acker, 2001). There have been different explanatory models of SUDs. Excessive alcohol use has been highly moralized from the religious standpoint (Merrill, 1988; Sasson, 1994). In the 19<sup>th</sup> and 20<sup>th</sup> centuries, social movements such as the temperance, influenced by religious beliefs, promoted alcohol prohibition (Merrill, 1988). Individuals whose behavior caused problems in public due to alcohol intoxication were considered as morally weak (Fekjær, 2004). The moralization of SU was reflected in the first two versions of the Diagnostic and Statistical Manual of Mental Disorders DSM-I, DSM-II (APA, 1952, 1968), in which alcoholism and drug dependence were defined as symptoms (secondary) among

individuals with highly stigmatized behaviors such as personality disturbances (e.g., those whose behavior was harmful to other individuals and the society). This view had strong roots in the psychodynamic theory (Grob, 1991).

Eventually, the moralistic view of the concept of SUD transitioned to a disease view. Such a paradigm change was propelled by Jellinek's typologies of alcoholism (1960). After observing that the most severe types of alcoholics showed a loss of control over alcohol intake, he suggested that alcoholism was as a disease. In addition to Jellinek's disease concept of alcoholism, other scientific advances such as the Feighner diagnostic criteria (Feighner et al., 1972) for psychiatric research and later, the Research Diagnostic Criteria (Spitzer, Endicott, & Robins, 1978) contributed to this paradigm shift and influenced the conceptualization of SUD in the next iteration of the DSM.

With the publication of the DSM-III (APA, 1980), SUD was for the first time acknowledged as a distinct disorder (no longer as a symptom of personality disturbances). SUD was described as behavioral changes due to continued SU affecting the central nervous system (APA, 1980). The DSM-III presented detailed descriptions of the differences between SU, substance abuse and dependence. Furthermore, substance abuse and dependence were introduced as two separate diagnostic categories. Substance abuse referred to long-lasting patterns of pathological SU with negative interpersonal and occupational consequences. On the other hand, substance dependence was the most severe form of pathological SU. For this category exclusively, evidence of physical dependence (i.e., tolerance and withdrawal symptoms) (APA, 1980) was required. Thus, while the presence of social consequences were important for the diagnosis of substance abuse, the physiological symptoms were important for the diagnosis of substance dependence. Furthermore, in the DSM -III it was posited that specific substances resulted in abuse (cocaine and hallucinogens), dependence (tobacco) or both (barbiturates, opioids, amphetamines and alcohol and cannabis) (APA, 1980).

As psychological and behavioral symptoms, not only physiological symptoms (tolerance and withdrawal) were observed in substance dependence, the criteria for the substance dependence category were expanded in the revised version of the DSM-III, the DSM III-R (APA, 1987). The diagnostic criteria included some of the symptoms from the category of substance abuse (APA, 1987). The category of substance abuse applied in the absence of the physiological symptoms and the presence of social consequences (APA, 1987). Through the accumulating research, there was a growing recognition that SUD consisted of cluster symptoms and the word syndrome was integrated in the definition of SUD. In the WHO's International Classification of Diseases, ninth version (ICD-9) (1975), the concepts "alcohol dependence syndrome" and "drug dependence" were used.

### **The current concept of SUD**

Similar to the previous versions, in the DSM-IV and DSMIV-TR as well in the ICD-10, SUD is defined by two categories. In the DSM-IV these are termed "substance dependence" and "substance abuse" (APA, 1994, 2000). In the ICD-10 the categories are termed "substance dependence" and "harmful use" (WHO, 1992). Substance abuse/harmful use is considered as less severe than substance dependence (APA, 1994; WHO, 1992). Similar to the DSM-III-R, a diagnosis of substance abuse/harmful use applies in the presence of psychological symptoms along with social and legal problems, and in the absence of physiological symptoms (APA, 1994; WHO, 1992). Considering the consequences of SUD at different levels, there has been a recognition that physiological symptoms are neither necessary nor sufficient to fulfill the criteria for substance dependence (APA, 1994). In the ICD-10 (WHO, 1992) under the section "Mental and behavioral disorders due to psychoactive substance use", substance dependence is defined by the presence of negative behavioral, physical, psychological and social consequences in the individual due to continued SU. Thus, a biopsychosocial understanding of the concept of SUD emerged. Notably, in the DSM-IV

and ICD-10, a SUD is coded with respect to a specific (class of) substance such as alcohol, opiates, cannabinoids, sedative hypnotics, stimulants, hallucinogens, tobacco and inhalants (APA, 1994; WHO, 1992). It is suggested that alcohol, heroin (opiate) and crack cocaine (stimulant) are the top three most harmful substances (Nutt, King, & Phillips, 2010).

In 2000, the scientific community and health care system were encouraged to recognize substance dependence as a chronic disease, deserving treatment at the same level as other chronic medical conditions (McLellan, Lewis, O'Brien, & Kleber, 2000). This represented an important advance on the understanding of SUD.

In sum, the concept of SUD has transitioned from being highly moralized and considered symptomatic of individuals with personality disturbance (APA, 1968) to a chronic disease (Jellinek, 1960). The concept of SUD is understood as a complex interplay between biological, psychological and social factors.

### **The development of the concept of SUD in the Norwegian health care system**

The above-mentioned paradigm changes have had consequences for the health care system of SUD in Norway. The social consequences of problematic alcohol use (e.g., absence from work place, economic and legal problems) increased in the 18<sup>th</sup> century (Fekjær, 2004), likely due to the increasing production and availability of distilled alcohol (Fekjær, 2004; White et al., 2001).

Initially, through a law implemented in 1907, individuals with the most severe drinking problems (and eventually with other substances) were penalized with forced labor and referred to health care (Ministry of Justice and Police, 2005). After some decades, in 1970 this law was abolished as a result of an increasing humanization in the field (Ministry of Justice and Police, 2005). However, despite this attempt to reduce the stigma associated with problematic SU, it was considered a symptom of underlying psychological, familiar and

social problems (Department of Social Affairs, 1975-76) Therefore, no particular changes were made in health care for these individuals, i.e., they continued receiving the traditional health and community care (Ministry of Justice and Police, 2005).

In 1997, the government noted that some individuals were not motivated to achieve total abstinence and proposed harm reduction strategies, such as free syringes for the use of narcotics (Norwegian Ministry of Health and Social Affairs, 1996-97). Despite these changes in the field, it has taken time to recognize that individuals with SUDs require comprehensive treatment.

In 2004, by a new substance abuse reform, the responsibility for the treatment of SUD was transferred from the social services of the county authorities to the state regional health authorities (Ministry of health, 2004). With this new reform, the government aimed to end stigmatization and recognized that individuals with SUDs had treatment needs at different levels (Ministry of health, 2004). Accordingly, these individuals were granted ordinary patient status, with access to specialized health services. SUD treatment encompassed multidisciplinary care and inter-agency collaboration. These changes were reflective of the biopsychosocial model of SUD. Nevertheless, some practical obstacles in the implementation of the substance abuse reform are noted, e.g., concerning the inter-agency collaboration (i.e., between the specialized health services and the primary community services) (Norwegian Medical Association, 2006), implying that there is still room for improvement in the operationalization of the current biopsychosocial concept of SUD.

In sum, the national reforms undertaken as an attempt to remove the stigma associated with SUDs have not ended the shame and stigma associated with having a SUD. As long as there is uncertainty as to whether or not SUD is a disease, the shame and stigma embodied in the culture will prevail.

### **1.1.2. Prevalence of SUDs**

Statistics from 2010 indicate that in Western countries such as Norway, 9.6% of individuals are diagnosed with alcohol use disorders (AUDs) and 10.9% with other SUDs (Whiteford et al., 2013). Furthermore, in Europe cannabis is the most frequently abused illicit substance (European Monitoring Centre for Drugs and Drug Addiction, 2010). As concerns Norway, there is limited research on the prevalence of SUDs in the general population. However, epidemiological studies among individuals living in rural and urban areas have indicated a lifetime prevalence of AUDs between 9.4-22.7% and between 0.4-3.4% of non-alcohol SUDs (Kringlen, Torgersen, & Cramer, 2001, 2006). The 12-months prevalence for AUDs was estimated to be between 3.1-10.6% and of 0.9% for other SUDs. Men were overrepresented in these studies (Kringlen et al., 2001, 2006). International studies suggest that only a minority of individuals with a SUD in the general population seek SUD treatment, likely due to their perception of severity of substance use (Alonso et al., 2004; Grella, Karno, Warda, Moore, & Niv, 2009).

National data from 2008 showed that alcohol and heroin were the most frequently used substances among individuals receiving SUD treatment (Iversen, Lauritzen, Skretting, & Skutle, 2009). The first national statistics based on the ICD-10 criteria among SUD patients were available in 2011 (Norwegian Institute for Alcohol and Drug Research, 2012). According to these data, among 8817 individuals who received treatment for non-alcohol SUDs in 2011, 70% were men. This overrepresentation of men is similar to the earlier reported among SUD treatment seekers as well as the general population (Iversen et al., 2009; Kringlen et al., 2006). Furthermore, dependence diagnoses of opioids, followed by stimulants and cannabis were the most frequent non-alcohol SUDs diagnoses registered among inpatients in 2011 (Norwegian Institute for Alcohol and Drug Research, 2012). Around one third of treatment seekers were registered as having polysubstance use disorders.



In sum, SUDs are more frequent among men in the general population as well as among SUD treatment seekers. Among illicit substances, cannabis is the most frequently abused in the general population. Among SUD treatment seekers, the most frequently used illegal substances are opioids and stimulants followed by cannabis.

### **1.1.3. The recognition of psychiatric comorbidity in SUDs**

The presence of mental problems resulting from SUDs has been reported early in the literature (Pinel, 1806). Eventually, the recognition of psychiatric comorbidity in SUD has represented another important advancement in the field. One of the initial categorizations of comorbid disorders was provided by Feighner et al. (1972), proposing that in the presence of comorbid disorders, the age of onset should provide a guideline in distinguishing primary from secondary disorders. In the DSM-III and DSM III-R, comorbidity was present whenever organic disorders influenced the appearance of non-organic disorders (APA, 1980, 1987). In the DSM-IV, DSM-IV-TR and ICD-10, comorbidity is distinguished in terms of whether or not a psychiatric disorder is primary or a result of a SUD, defined as “substance-induced disorder” (APA, 1994, 2000; WHO, 1992). As discussed in the following sections, in some cases defining a primary from a secondary psychiatric disorder represents diagnostic challenges.

### **Prevalence of psychiatric comorbidity in SUDs**

Findings among SUD patients suggest that around 65% have a comorbid psychiatric disorder, most frequently anxiety disorders, mood disorders and personality disorders (Ross, Glaser, & Germanson, 1988; Verheul et al., 2000). Similar numbers of psychiatric comorbidity have been reported in the general population (Merikangas et al., 1998). In some cases, it is unclear whether psychiatric comorbidity precedes SUDs or not (Verheul et al., 2000).

A limited number of studies have assessed the prevalence of psychiatric comorbidity among SUD patients in Norway. One study reported that a majority of SUD patients had anxiety and depression, although formal diagnostic criteria were not used (Lauritzen, Waal, Amundsen, & Arner, 1997). Importantly, the authors observed that the number of substances consumed reflected the severity of psychiatric problems (Lauritzen et al., 1997). Another study assessed the prevalence of psychiatric comorbidity among SUD patients. In more than two thirds of the cases, psychiatric disorders preceded SUDs (Landheim, Bakken, & Vaglum, 2002). The presence of axis I and II disorders among SUD patients was 87% and 71%, respectively (Landheim et al., 2002), of which anxiety (76%), depression (58%), and personality disorders (cluster A 38%, cluster B 43% and cluster C 19%) were most frequently reported.

With respect to ADHD among SUD patients less has been reported. One study revealed a higher prevalence of anxiety and mood disorders than ADHD and conduct disorder among SUD patients (Chan, Dennis, & Funk, 2008). The authors noted that although anxiety and mood disorders were more frequent, ADHD and conduct disorder were present in around 30% of SUD patients and that in these cases a more severe SUD was observed (Chan et al., 2008).

In sum, psychiatric comorbidity is the rule rather than the exception among SUD patients (Landheim et al., 2002). Although ADHD may not be the most prevalent comorbidity in SUD, individuals with SUD+ADHD show increased SU severity (Chan et al., 2008).

## **1.2. Attention deficit hyperactivity disorder (ADHD)**

Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder also described in the ICD-10 as Hyperkinetic Disorders (APA, 1994, 2000, 2013; WHO, 1992), characterized by the core symptoms of inattention, hyperactivity and impulsivity. ADHD causes functional impairment to different degrees of severity (Asherson, 2005; Biederman et al., 2006; Kooij et al., 2010). Increasingly, research indicates that the presentation of ADHD symptoms is changing from childhood to adulthood, with important individual differences (Kooij et al., 2010).

### **1.2.1. The development of the concept of ADHD**

Early observations among children showing symptoms consistent with those of ADHD, were frequently linked to brain damage or dysfunction (either innate or acquired early in life). In 1798 in a book chapter, Crichton distinguished between children with normal and abnormal attention. The former consisted of difficulties in sustaining attention over time. He suggested that in some cases, this was caused by early accidental diseases (reprint in Crichton, 2008). Furthermore, the hyperactivity symptoms observed in children seemed to be frequently addressed and influenced the later descriptions of the disorder. In 1902, George Still reported some cases of children with hyperactivity, overly passionate behavior and with attention problems (Still, 1902). He attributed such behavior to a “defect of moral control” to physical or mental diseases. Further, in the 1920s negative behavior in children such as impulsivity, mind wandering, emotional instability and delinquency was attributed to an epidemic of encephalitis lethargica (Economo, 1929). Moreover, Kramer and Pollnow (1932) suggested that as a result of brain disease, some children showed “hyperkinetic disease” with symptoms of inattention, hyperactivity and impulsivity. Decades later, Laufer and Denhoff (1957) used the term “hyperkinetic childhood syndrome” to describe similar symptoms in children. They suggested an underlying dysfunction which would improve throughout the lifespan. Clements

and Peters (1962) used the concept of “minimal brain dysfunction” to describe similar childhood symptoms as those previously mentioned.

The concept of childhood ADHD went through further calibrations before the persistence of ADHD into adulthood was considered in the DSM-IV (APA, 1994). In the DSM II, the concept of “hyperkinetic reaction of childhood” was used (APA, 1968). As the recognition of the inattention was increasing, the diagnostic concept was relabeled “attention deficit disorder (ADD) with and without hyperactivity” in the DSM III (APA, 1980). However, it was unclear whether this new dichotomy of ADD with and without hyperactivity corresponded to the descriptions in the diagnostic manual. In the DSM-III-R the diagnostic concept was therefore renamed “attention deficit hyperactivity disorder” (APA, 1987). Interestingly, in the DSM-III, the persistence of the disease in adults was first coded as residual ADHD (i.e., individuals who did not meet full childhood criteria but still had significant life impairment) but it was omitted in the DSM-III-R (APA, 1987).

In the ICD, the concept “hyperkinetic syndrome of childhood” was used (WHO, 1974) and changed in the ICD-9 and ICD-10 to “Hyperkinetic disorders” (WHO, 1975,1992). The concept used in the DSM-IV and DSM-IV-TR was “attention deficit/hyperactivity disorder”. At this point, the subtypes predominantly inattentive, predominantly hyperactive/impulsive and combined were introduced. In the DSM-IV and DSM-IV-TR, the persistence of ADHD in adolescents and adults (i.e. having consequences in their functioning) was specified as partial remission, instead of residual (APA, 1994, 2000; WHO, 1992). In the DSM-IV and ICD-10, the descriptions of the core symptoms for ADHD/Hyperkinetic disorders are similar and a childhood onset is required (before seven years of age) (APA, 1994, 2000; WHO, 1992). However, in the DSM-IV the presence of either inattention symptoms or hyperactivity/impulsivity symptoms is sufficient to fulfill the criteria for ADHD, whereas in the ICD-10 the presence of inattention, hyperactivity and impulsivity symptoms is necessary

to fulfill the criteria for Hyperkinetic disorders. Furthermore, the ICD-10 has more stringent requirements for the presence of comorbidity than the DSM-IV (APA, 1994; WHO, 1992).

In sum, similar to the concept of SUD, the concept of ADHD has been understood differently over time. ADHD has primarily been understood as a disorder in some children with inattention, overactive and impulsive behavior (with possible early brain dysfunction or damage), which would improve in adulthood (e.g., Crichton, 2008; Laufer & Denhoff, 1957; Still, 1902). Adult ADHD was eventually recognized as a result of research indicating poor functioning associated with persistent ADHD (Biederman et al., 2006).

### **1.2.2. ADHD in adults: prevalence, challenges in the recognition and clinical presentation**

#### **Prevalence**

Findings from meta-analyses indicate a prevalence of ADHD in children of 5.3% (Polanczyk, de Lima, Horta, Biederman, & Rohde, 2007). Research shows that boys are more likely to be diagnosed with ADHD than girls (Biederman et al., 2002). Frequently, boys present the combined ADHD subtype (i.e., inattention plus hyperactive/impulsive symptoms), whereas the predominantly inattentive subtype has been reported to be more frequent among girls (Biederman et al., 2002; Gibbins et al., 2010). Boys' disruptive behavior associated with hyperactivity/impulsivity may motivate referrals from parents to a greater extent than inattention (Biederman et al., 2002).

Among adults the prevalence of ADHD is reported to be 2.5% (Simon, Czobor, Balint, Meszaros, & Bitter, 2009). In contrast to childhood and adolescence no substantial gender differences in the prevalence of ADHD in adults are reported (Biederman et al., 1994). The combined subtype appears to be the most frequent and most severe in both genders (Biederman et al., 1994; Halmoy, Fasmer, Gillberg, & Haavik, 2009; Rasmussen & Levander,

2009; Wilens et al., 2009). It has been shown that adult ADHD is associated with important functional challenges such as dysfunctional relationships, education, occupation and work-related activities, legal problems and car accidents (Goodman, 2007; Halmoy et al., 2009; Kessler, Adler, Ames, Barkley, et al., 2005; Kessler, Adler, Ames, Demler, et al., 2005; Rasmussen & Levander, 2009; Schubiner et al., 2000).

### **Challenges in the recognition of ADHD in adults**

The recognition of adult ADHD is relatively recent, as for decades it was presupposed that ADHD was a childhood disorder only (APA, 1968). However, clinical (Biederman et al., 1994; Stovner, Wyller, Skulberg, Os, & Korsmo, 1996), epidemiological (Kessler et al., 2006) and follow-up studies (Hill & Schoener, 1996; Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1993, 1998; Menkes, Rowe, & Menkes, 1967) have demonstrated the persistence of childhood ADHD in adults as well.

The identification of ADHD in adults may differ from the identification among children. While children may be referred by their parents or care takers, the burden associated with persistent ADHD may motivate self-referrals in adults, regardless of gender (Rasmussen & Levander, 2009). Furthermore, the diagnostic criteria have typically not reflected the ADHD presentation in adults. For example, while the hyperactive/impulsive symptoms in childhood are reported to decline in adulthood (Wilens et al., 2009), it is unclear whether this is due to their validity among adults (Gibbins et al., 2010). Other challenges in identifying adult ADHD involve difficulties in self-identifying the ADHD symptoms, particularly those related to impulsivity (Barkley, Fischer, Smallish, & Fletcher, 2002; Mannuzza, Klein, Klein, Bessler, & ShROUT, 2002; Young & Gudjonsson, 2005) not having the same access to treatment and follow-up as children and adolescents with ADHD (Hundevadt, 1997) and differentiating ADHD symptoms from other comorbid psychiatric disorders (Kooij et al., 2010). Further, despite that ADHD decreases with age in some cases, stringent diagnostic

requirements to meet the full symptom ADHD criteria may impede the identification of cases with important functional impairment notwithstanding fewer ADHD symptoms (Faraone, Biederman, & Mick, 2006).

### **Clinical presentation**

Adults with ADHD are characterized by inadequate functioning in their everyday life. Those with persistent attention deficit may struggle organizing their everyday tasks due to difficulties sorting out important from non-important stimuli, finishing important projects, being easily inattentive and forgetful, leading to low tolerance to frustration (Kooij, et al., 2010). Attention deficit may also signify spending important amount of time overly focusing on one thing or activity, in a way that has consequences for other activities (Brown, 2006). While hyperactivity may be externalized in childhood, it may be internalized in adulthood. For example, it may be expressed as a constant stream of thoughts, over-talkativeness (one-way conversations), persistent inner restlessness, difficulties relaxing and frequent fidgeting (micro movements) (Kooij, et al., 2010). Adult impulsivity may be expressed as getting easily bored and acting before thinking thoroughly the consequences of one's choices. There is also a persistent proneness to seek for rewarding activities as well as unsuccessful attempts to resist responding to interesting stimuli (Kooij, et al., 2010). Symptoms of impulsivity frequently cause trouble and may interfere with the individuals' original plans, goals and values such as unplanned overly spending of money or promiscuity while in a committed relation (Kooij et al., 2010; Ryffel-Rawak, 2009). Additionally, some adults may have frequent mood swings (Asherson, 2005). Adults with ADHD may not adequately possess age-appropriate everyday life coping strategies which represents a challenge since adults are expected to be independent and have control over their own lives (Canu, Newman, Morrow, & Pope, 2008).

### **1.2.3. Comorbidity in adult ADHD**

It is reported that 75-80% of adults with ADHD have at least one additional disorder (Aanonsen et al., 2004; McGough et al., 2005), of which mood disorders (20-37%) (Amons, Kooij, Haffmans, Hoffman, & Hoencamp, 2006; Kessler, Adler, Barkley, et al., 2005), anxiety disorders (15-28%) (Biederman et al., 1993; Kessler, Adler, Barkley, et al., 2005), personality disorders (23-36%) and SUDs (12-45%) (Biederman et al., 1993; Kessler, Adler, Ames, Demler, et al., 2005) are among the most frequent. In addition, learning disabilities and sleep disorders (Weiss, Gadow, & Wasdell, 2006; Willcutt et al., 2010) are often present in individuals with ADHD. Identifying ADHD in adults may be difficult due to symptom overlap between some of these disorders and ADHD (Biederman et al., 1995; Carroll & Rounsaville, 1993; Fayyad et al., 2007; Levin, 2007; Mannuzza et al., 1993, 1998; Mannuzza et al., 1991; McGough et al., 2005). In the assessments of adults with possible ADHD, it should be determined whether the comorbid psychiatric disorders are different diagnoses or additional to ADHD (Directorate of Health and Social Affairs, 2007).

In sum, a large body of research has demonstrated that in many cases ADHD persists into adulthood (Faraone et al., 2006; Mannuzza et al., 1998) with negative consequences in different life domains (e.g., Kessler, Adler, Ames, Barkley, et al., 2005; Rasmussen & Levander, 2009). The presentation of ADHD in adults frequently differs from that in children (Kooij et al., 2010). The vast majority of adults with ADHD have at least one comorbid psychiatric disorder (Aanonsen et al., 2004), which makes its identification challenging (Biederman et al., 1995).



### **1.3. The overlap between SUD and ADHD**

#### **1.3.1. Prevalence of adult ADHD among SUD patients**

The prevalence of adult ADHD among individuals with SUD is estimated to vary between 3% and 54%, being fairly inconsistent, among other reasons, due to variability in diagnostic methodologies (Hannesdottir, Tyrfingsson, & Piha, 2001; Ohlmeier et al., 2008). Similar to the challenges distinguishing ADHD from comorbid disorders, identifying ADHD among individuals with SUD is difficult since some of the symptoms of SUD and others present in SUD overlap those of ADHD (Kalbag & Levin, 2005). The use of systematic and reliable methods for the assessment and diagnosis of ADHD among SUD patients has been recommended (Adler, Guida, Irons, Rotrosen, & O'Donnell, 2009; Goossensen et al., 2006). As concerns gender, some studies indicate an overrepresentation of men with ADHD in SUD treatment (Cumyn, French, & Hechtman, 2009; Schubiner et al., 2000).

#### **1.3.2. Possible explanations for the overlap between SUD and ADHD**

The mechanisms of a link between SUD and ADHD are still unclear. One possibility is that individuals with ADHD use substances to self-medicate their symptoms (Carroll & Rounsaville, 1993; Horner & Scheibe, 1997). Another possible explanation is that in SUD and ADHD there is a similar dysregulation in dopaminergic pathways in charge of regulating self-directive behavior and control of impulsivity (Blum et al., 2008; Frodl, 2010). Additionally, environmental factors may be important for a development of SUD among young individuals with ADHD such as child maltreatment, neglect and parental SUDs (Biederman et al., 2008; De Sanctis et al., 2008; Kessler, Adler, Barkley, et al., 2005; Knop et al., 2009; Lauritzen et al., 1997). It is unclear whether the development of SUD occurs through conduct disorder or antisocial personality disorder. However, it is likely that ADHD alone increases the risk of developing SUD early in life (Biederman, Wilens, Mick, Faraone, & Spencer, 1998; Knop et al., 2009).

### **1.3.3. Clinical presentation**

Research has shown that SUD+ADHD patients are younger (Johann, Bobbe, Putzhammer, & Wodarz, 2003), show an earlier onset of SU, have a faster transition from SU to (non-alcohol) SUDs (Biederman, Wilens, Mick, Faraone, & Spencer, 1998; Klein & Mannuzza, 2010), have a higher SU severity (Carroll & Rounsaville, 1993; Ohlmeier et al., 2007), show more psychiatric comorbidity (Wilens et al., 2005) and a poorer cognitive functioning (Brooks, Vosburg, Evans, & Levin, 2006) compared to SUD-ADHD patients. SUD+ADHD patients may run a higher risk of dropping-out from SUD treatment if it does not appeal to their needs (Levin et al., 2004). Therefore, more knowledge about how they relate to SUD treatment is necessary.

In sum, the estimated prevalence of ADHD among SUD patients has been variable due to different methodologies and differential diagnosis with other comorbid psychiatric disorders (Hannesdottir et al., 2001; Kalbag & Levin, 2005). Self-medication and related dopaminergic dysfunctioning (Blum et al., 2008; Carroll & Rounsaville, 1993) are some possible explanations of the link between SUD and ADHD. SUD+ADHD patients show more complicated clinical characteristics than SUD-ADHD patients (Ohlmeier et al., 2008).

### **1.4. Knowledge gap**

Since ADHD is frequent among SUD treatment seekers and SUD+ADHD patients show a more complex clinical presentation than SUD-ADHD patients, SUD treatment should be meaningful to them. Research among SUD+ADHD individuals has mostly focused on symptom reduction (Levin et al., 2006; Weiss et al., 2006). However, there is limited research investigating SUD+ADHD patients in relation to factors such as personality, SU-related aspects (readiness to change, positive and negative aspects of substance use and SU-related treatment goals) and quality of life (QoL). These factors are commonly investigated in the

SUD field. Nevertheless, it is still largely unknown whether SUD+ADHD patients relate to their SUDs differently from SUD-ADHD patients.

#### **1.4.1. Personality**

Personality as described in Cloninger and colleagues' biopsychological model (Cloninger, Przybeck, Svrakic, & Wetzel, 1994; Cloninger, Svrakic, & Przybeck, 1993), consists of temperament and character and is the result of a complex interplay of psychological, social, genetic, cultural and spiritual factors. Temperament is mostly biologically determined, becomes stable over time (habit formation) and is regulated by subcortical structures. On the other hand, character is more susceptible to environmental influences (conscious goals and values) and regulated by higher order structures (Cloninger et al., 1994). Notably, maturity and well-being can be achieved by exercising our character (Cloninger, 2004). The assessment of personality may be useful to provide information on the individual's resources and challenges that can be useful in adapting SUD treatment to patients' needs.

Personality has been investigated separately in the SUD and ADHD field. Individuals with SUD as well as ADHD, show high levels of novelty seeking (e.g., impulsivity, risk taking behavior) and an inadequate self-directed behavior (e.g., less mature and purposeful behavior) (Evren, Evren, Yancar, & Erkiran, 2007; Herrero, Domingo-Salvany, Torrens, Brugal, & Gutierrez, 2008; Le Bon et al., 2004; Monras, Mondon, & Jou, 2008). In the SUD field, it is suggested that personality can be influenced by factors such as type of problematic SU (Evren et al., 2007). For instance, AUDs have been associated with anxious temperament styles, compared to non-alcohol SUDs (Evren et al., 2007). Studies measuring personality among SUD+ADHD patients are limited. One study found that smokers (with moderate nicotine addiction) with ADHD showed higher levels of novelty seeking (e.g., impulsivity) compared to smokers without ADHD (Downey, Pomerleau, & Pomerleau, 1996). Similar

results were reported in a study comparing SUD+ADHD patients with SUD patients with other psychiatric comorbidities (Sizoo, van den Brink, Gorissen van Eenige, & van der Gaag, 2009). These studies, comparing the personality of SUD+ADHD and SUD-ADHD patients, indicate more pronounced personality profiles among SUD+ADHD individuals (e.g., higher levels of novelty seeking). However, it is unclear to which extent the findings on nicotine addiction in adults with ADHD are applicable to other SUDs. Therefore, more research is necessary on this topic by comparing SUD+ADHD patients with SUD-ADHD patients in relation to other substances.

#### **1.4.2. Substance use-related aspects**

Given the important prevalence of ADHD in combination with SUDs and the severity of SUDs among SUD+ADHD patients (Carroll & Rounsaville, 1993; Wilens, 2007), research on how these patients relate to their own SU in the context of SUD treatment is surprisingly scarce. SUD+ADHD patients may profit from SUD treatment if more attention is given to how they perceive their own SUDs compared to SUD-ADHD patients. One way of investigating this is to focus on SU-related aspects such as readiness to change, patients' perceptions on the positive and negative aspects of substance use and SU-related treatment goals.

#### **Readiness to change**

Readiness to change is a common concept in SUD treatment (Prochaska, DiClemente, & Norcross, 1992; Zhang, Harmon, Werkner, & McCormick, 2004). Readiness to change consists of the stages of precontemplation (no motivation to change), contemplation (ambivalence), preparation (readiness), taking steps (acting), maintenance and relapse (Prochaska & DiClemente, 1983; Prochaska et al., 1992). According to this model, intentional change of problematic SU is propelled when the individual evaluates that the costs of SU are greater than the benefits (Blume & Schmaling, 1997; Vilela, Jungerman, Laranjeira, &

Callaghan, 2009). However, realizing the pros and cons of problematic SU requires awareness, self-reflection and adequate cognitive functioning (Blume, Schmalting, & Marlatt, 2005; Edens & Willoughby, 1999). Studies indicated that the process of change is similar among SUD patients with comorbid psychiatric disorders (Blume & Schmalting, 1998; Willoughby & Edens, 1996; Zhang et al., 2004). Furthermore, research suggests that individuals with SUD and comorbid disorders likely need extra assistance in the process of change (Finnell, 2003). Since there are no studies considering the readiness to change among SUD+ADHD patients, it is unclear whether the process of change represents a greater problem to them as compared to SUD-ADHD patients due to core symptoms of inattention and hyperactivity/impulsivity (APA; 1994). More research on this topic is needed.

In sum, awareness of problematic SU facilitates the process of change (e.g., in the evaluation of the pros and cons of problematic SU). However, this process requires adequate cognitive abilities (Blume et al., 2005). Due to the problems related to ADHD (APA, 1994), it is unknown whether the process of change is more challenging for SUD+ADHD patients compared to SUD-ADHD patients.

### **Positive and negative aspects of SU**

As described in the previous section, awareness of the positive and negative aspects of SU is necessary in order to change a problematic SU (Cunningham, Sobell, Sobell, & Gaskin, 1994; Prochaska & DiClemente, 1984). In addition, SUD patients tend to establish their treatment goals based on their own perception of SU severity, duration of SUDs, and negative consequences of SU (Blume & Marlatt, 2000; Lozano, Stephens, & Roffman, 2006; Maisto, Sobell, & Sobell, 1980). Nevertheless, so far it is unknown whether SUD+ADHD patients have different SU perceptions compared to SUD-ADHD patients. Potential differences in SU perceptions between the groups may require a different treatment focus.

Qualitative research on SUD patients' SU perceptions has mostly considered positive aspects of SU, such as the reasons for SU (e.g., Healey, Peters, Kinderman, McCracken, & Morriss, 2009), whereas less is known about the negative aspects of SU. The research on the reasons for SU suggests that SUD individuals with psychiatric comorbidity use substances to mitigate psychiatric symptoms (i.e., self-medication) (Khantzian, 1985) to improve social skills and for the rewarding effects (i.e., getting high) (Bizzarri et al., 2007; Goswami, Mattoo, Basu, & Singh, 2004; Healey et al., 2009). Studies comparing SUD+ADHD and SUD-ADHD individuals concerning this topic have been inconsistent. While some have reported that individuals with SUD+ADHD used substances to self-medicate to a greater degree than SUD-ADHD individuals (Horner & Scheibe, 1997), others have found no differences between SUD+ADHD and SUD-ADHD individuals concerning SU for self-medication purposes and for their rewarding effects (Wilens et al., 2007).

In sum, SUD patients' perceptions of the positive and negative aspects of SU are important in the process of changing SU and are likely to impact patients' treatment goals (Lozano et al., 2006). Research is inconsistent on whether SUD+ADHD individuals relate differently to SU than SUD-ADHD individuals (Horner & Scheibe, 1997; Wilens et al., 2007).

### **Treatment goals**

Investigating the treatment goals from the patient's perspective is particularly important because there have been reports indicating that patients and clinicians differ in the priorities for treatment (Palmer, Murphy, Piselli, & Ball, 2009). To our knowledge, there are no studies on the treatment goals choices among SUD+ADHD patients. Since a positive therapeutic alliance is paramount in SUD treatment (Healey et al., 2009; Project Match Group, 1997), attaining a consensual understanding of which treatment goals SUD+ADHD patients define as workable should be a natural result of an adequate patient-clinician alliance.

As described earlier, the SUD field has been subjected to different paradigm changes. These have likely influenced the type of intervention offered to individuals with SUDs. The moral paradigm of SUD was likely translated into total abstinence. For instance, some 12-step SUD clinics are influenced by the ideology of one of the largest self-help groups world-wide, Alcoholics Anonymous (AA), founded in 1935 (Alcoholics Anonymous., 1955) and later expanded to Narcotics Anonymous (NA) (Narcotics Anonymous., 1993). They recommend that the only way to overcome SUD is through total abstinence, an internal moral examination and by relying on a higher power with the support of the group (Alcoholics Anonymous., 1955).

When the medical model has been strongest in the health care system, health care professionals have been considered as the experts, making decisions on treatment, whereas patients had little involvement in their own treatment (Joosten et al., 2008). Some studies suggest that even though there is a growing acceptance for goals of substance reduction (Rosenberg & Davis, 1994), goals of total abstinence are preferred by health care professionals in SUD treatment (Brochu, 1990). Treatment goals of substance reduction seem to be viable depending on how severe the patients are judging their own SU (Lee & Zerai, 2010; Maisto et al., 1980). A study examining the SU goals of individuals with marijuana SUD over time (Lozano et al., 2006) found that treatment goals were mostly consistent with outcomes (e.g., individuals who initially chose total abstinence were more likely to abstain over time (Lozano et al., 2006). The emergence of the biopsychosocial model of SUD may still be in a process of integration in treatment of SUD. This model may enable a meaningful therapeutic alliance, in which SUD patients' treatment goals preferences can be openly discussed. According to the reviewed literature, it is possible that SUD+ADHD patients set treatment goals according to their own perception of SU severity. However, this should be further investigated.

In sum, it is unclear whether SUD+ADHD patients relate differently from SUD-ADHD patients on SU-related aspects (i.e. in readiness to change, the positive and negative aspects of SU and treatment goals). In the context of SUD treatment, if SUD+ADHD patients relate differently to SU as SUD-ADHD patients, differential interventions may be necessary to treat SUD+ADHD patients.

### **1.4.3. Quality of Life (QoL)**

According to the WHO, QoL refers to how individuals experience their own circumstances, goals and interests in life, according to their value system and cultural context (The WHOQOL Group, 1995). QoL is a subjective measure, implying individual differences. Important domains comprising the QoL of an individual are the physical, psychological, social and environmental (The WHOQOL Group, 1995).

The concept QoL is commonly addressed by patients living with chronic conditions (Cella et al., 2007) and in the SUD field it has been gradually investigated (Donovan, Mattson, Cisler, Longabaugh, & Zweben, 2005; McLellan, Chalk, & Bartlett, 2007). However, as concerns SUD, QoL has not had the same importance as a primary indicator of improvement compared to substance reduction or substance abstinence. In the ADHD field, QoL has been associated with life productivity, psychological health, social relations and life outlook (Brod, Johnston, Able, & Swindle, 2006), as well as the severity of ADHD (Safren, Sprich, Cooper-Vince, Knouse, & Lerner, 2010; Weiss et al., 2010). Importantly, research suggests that even when individuals with SUD experience an improved QoL, it may not reach the same levels as among individuals in the general population (Donovan et al., 2005). There are no prospective studies comparing the QoL of individuals with SUD+ADHD and SUD-ADHD. Nevertheless, it has been observed that QoL may remain low over time among individuals with SUD plus psychiatric comorbidity compared to those without (Mazza et al., 2009; Saatcioglu, Yapici, & Cakmak, 2008). Given these results, it is unclear whether the



QoL of SUD+ADHD patients improves or remains unchanged compared to SUD-ADHD patients and individuals from the general population.

## **2. Aims**

The overall aim of this study was to investigate whether SUD+ADHD patients differ from SUD-ADHD patients in terms of personality, SU-related aspects and QoL. The specific aims were:

1. To explore differences in personality between SUD+ADHD and SUD-ADHD patients.
2. To investigate whether SUD+ADHD patients differ in their readiness to change SU, perceptions on the positive and negative aspects of SU and treatment goals, compared to SUD-ADHD patients.
3. To compare the QoL of SUD+ADHD and SUD-ADHD patients at baseline and 12 months after SUD treatment. In addition, to compare the SUD groups with cross-sectional data from a national population sample.

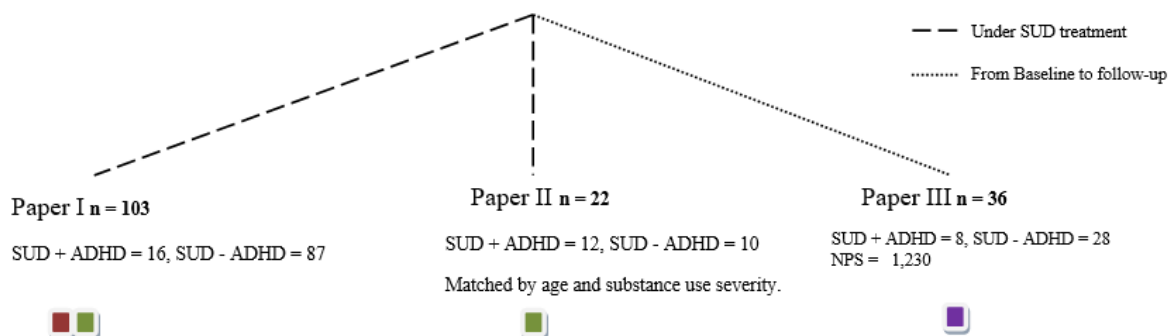
### **3. Materials and Methods**

#### **3.1. Study design and sample**

This was an observational prospective study comprising quantitative and qualitative data (mixed methods research). The recruitment period was between February 1<sup>st</sup>, 2010 and July 31<sup>th</sup>, 2012 at SUD treatment unit ReStart, and between June and July 2012 at the Therapeutic Community Færingen unit (today Rusbehandling Ung). Both units are under the Division of Mental Health and Substance Abuse at the University Hospital of Northern Norway. The study was approved by the Regional committee for medical and health research ethics, REK sør-øst B, 2009/1355b. In the Restart unit inpatient SUD treatment lasted two months and six to eight months in the Færingen unit. SUD patients of both genders were eligible to participate if they had previously been under detoxification treatment, irrespective of history of SUD treatment, medication status (e.g., opioid-maintenance therapy), comorbid mental and/or physical conditions or type of admission (voluntary, involuntary, completion of prison sentence in institution). Exclusion criteria were serious conditions of behavioral (e.g., aggressiveness), mental/cognitive (e.g., psychosis, memory problems) or physical character (e.g., chronic pain) which would hinder participation, no command of the Norwegian language and getting treatment in short follow-up readmissions.

Two hundred and sixteen individuals entered SUD treatment (they had previously received detoxification) during the recruitment period (193 in the ReStart unit and 23 in the Færingen unit), whereof 179 were eligible to participate. Seventy-six patients declined. For ethical reasons, this group of patients could not be investigated further. The study sample consisted of 103 SUD patients who granted a written informed consent after receiving verbal and written information about the study (see Flow chart, paper I). An overview of papers I-III and aims of the study is presented in the following Figure 1.




Study sample initially recruited between February 2010 and July 2012 n=103 (SUD+ADHD=16; SUD-ADHD=87)



**Figure 1. Overview of papers I-III and aims of the study.**

Note.

SUD: Substance use disorder; ADHD: Attention deficit hyperactivity disorder; NPS: Norwegian population sample.

-  Aim 1: To explore differences in personality between SUD+ADHD and SUD-ADHD patients.
-  Aim 2: To investigate whether SUD+ADHD patients differ in their readiness to change substance use, perspectives on the positive and negative aspects of substance use and treatment goals, compared to SUD-ADHD patients.
-  Aim 3: To compare the QoL of SUD+ADHD and SUD-ADHD patients at baseline and 12 months after SUD treatment. In addition, to compare the SUD groups with cross-sectional data from a Norwegian population sample.

**Figure 1. Overview of papers I-III and aims of the study.**

### 3.1.1. SUD patients with an ADHD diagnosis

The assessment and diagnosis of ADHD involved determining the degree of impairment of ADHD symptoms in daily life experienced in childhood and adulthood, acquisition of additional information from family members and other important sources (e.g., school teachers), and assessment of co-occurring psychiatric disorders (Directorate for Health and Social Affairs, 2007; WHO, 1992). Physicians and psychologists are the accredited healthcare practitioners to carry out the assessment of ADHD. All study participants with an ADHD diagnosis were included irrespective of the time of the diagnosis. The information concerning the assessment and diagnosis of ADHD was obtained from the participants' clinical records.

### 3.1.2. SUD-ADHD patients

The SUD-ADHD patient group was comprised by patients without a diagnosis of ADHD (eight had been assessed for the disorder either previous to or during the course of this study), 70% were males. Five study participants from the treatment unit Færingen, consented to participate, none of whom were reached at follow-up.

### 3.2. Study measures and procedure

Data were collected at baseline and three, six and 12 months after SUD treatment, following treatment as usual (TAU) procedures. The study measures encompassed clinical interviews for axis I and II disorders (clinical and personality disorders), self-report questionnaires and qualitative interviews. An overview over the study measures utilized in paper I-III is presented in the following Table 1.

**Table 1** Overview of self-report measurements used in publications from the study

Measure	Description	Subscales/dimensions (subdimensions)	Paper
AUDIT <sup>a</sup>	Frequency and amount of alcohol use.	NA	I, II & III
DUDIT <sup>b</sup>	Frequency and amount of other substance use.	NA	I, II & III
ASRS <sup>c</sup>	Frequency of ADHD symptoms of inattention and hyperactivity/impulsivity.	Part A Part B	I & III I & III
TCI <sup>d</sup>	Personality styles. Temperament and character.	-Temperament: novelty seeking (exploratory, impulsive, curious) harm avoidance (fearful, fatigable, worrying) reward dependence (attached, dependent, sentimental) persistence (hard working, ambitious, eager to effort, perseverant).  -Character: self-directedness (responsible, mature, purposeful) cooperativeness (tolerant, empathic, helpful) self-transcendence (creative, self-forgetful, united with universe).	I  I
SOCRATES <sup>e</sup>	Readiness to change problematic substance use.	Recognition, ambivalence, taking steps.	I
WHOQoL-BREF <sup>f</sup>	Quality of life.	Physical health, psychological health, social relations and environment.	III

Note.

<sup>a</sup>Alcohol Use Disorders Identification Test; <sup>b</sup> Drug use Disorders Identification Test; <sup>c</sup> Adult ADHD Self-Report Scale; <sup>d</sup> Temperament and Character Inventory; <sup>e</sup> The Stages of Change Readiness and Treatment Eagerness Scale; <sup>f</sup> World Health Organization Quality of Life Questionnaire, short version.

### **3.2.1. Clinical interviews**

The assessments of axis I and II disorders were conducted by means of the Mini International Neuropsychiatric Interview (M.I.N.I-PLUS) (Sheehan et al., 1994) and the Structured Clinical Interview for DSM-IV (SCID II) (First, Spitzer, Gibbon, Williams, & Benjamin, 1995), respectively. In the ReStart unit, the neuropsychiatric interviews for axis I disorders were administered by trained clinicians and revised by the chief psychologist of the unit, who also decided on the final evaluation. Interviews for axis II disorders were all conducted by the chief psychologist and only when considered appropriate. In the Færingen unit, all interviews for axis I and II disorders were conducted by the units' chief psychologist. Diagnoses were based on the ICD-10 diagnostic criteria.

### **3.2.2. Self-report questionnaires**

The Alcohol Use Disorder Identification Test (AUDIT) was utilized to obtain information concerning alcohol use (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). The AUDIT consists of 10 items. For the last two items there are three answer alternatives: never (0), not this last year (2), during the last year (4). The highest possible score is 40. Scores  $\leq 8$  indicate low risk of alcohol consumption, scores 8 -15 indicate high-risk drinking, whereas scores  $\geq 20$  indicate high alcohol use severity.

The Drug Use Disorder Identification Test (DUDIT) (Berman, Bergman, Palmstierna, & Schlyter, 2005) was utilized to measure other (non-alcohol) substance use. The DUDIT consists of 11 items and is similar to the AUDIT in structure. For items 1-9 of the DUDIT there are four answer alternatives, ranging from never (0) to daily (4). For the last two questions, the answer alternatives are never (0), not this last year (2), during the last year (4). The maximum score is 44. Scores  $\geq 6$  indicate problematic use. Scores  $\geq 25$  indicate severe substance use.

At follow-up, the answer alternatives for the last two items of the AUDIT and DUDIT were adapted for participants to report on the time since their last visit, instead of the last year.

The Adult ADHD Self-Report Scale (ASRS) (Kessler, Adler, Ames, Demler, et al., 2005) was used to measure ADHD symptomatology. The ASRS consists of 18 items, divided in part A and part B. There are five answer alternatives on the frequency of ADHD symptoms, ranging from never (0) to very often (4). Part A encompasses six items measuring the most predictive symptoms of ADHD (Kessler et al., 2007; Taylor, Deb, & Unwin, 2011), with a maximum score sum of 24 and a cut-off score of  $\geq 14$ . Recently, a cut-off of  $\geq 11$  in part A has been recommended to carry out a full assessment of ADHD among SUD patients (Luderer et al., 2018). In the present study, the cut-off score of  $\geq 14$  was used as this the study was conducted before these recommendations were published. Part B encompasses 12 items, measuring the additional symptoms.

The Temperament and Character Inventory (TCI) was used to measure personality (Cloninger et al., 1994). The TCI comprises 240 items measuring four temperament and three character dimensions, which in turn encompass different subdimensions. Temperament dimensions (and subdimensions) are: novelty seeking (exploratory excitability, impulsiveness, extravagance, disorderliness), harm avoidance (anticipatory worry, fear of uncertainty, shyness and fatigability), reward dependence (sentimentality, openness to warm communication, attachment and dependence) and persistence (eagerness to effort, work hardened, ambitious and perfectionist). Character dimensions (and subdimensions) are: self-directedness (responsibility, purposefulness, resourcefulness, self-acceptance, congruent second nature), cooperativeness (social acceptance, empathy, helpfulness, compassion, pure-hearted conscience) and self-transcendence (self-forgetful, transpersonal identification, spiritual acceptance). The answer alternatives are true/false. Higher scores indicate stronger presence of the personality trait (Cloninger et al., 1994).

The Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES) (Miller & Tonigan, 1996) was used to measure readiness to change. The SOCRATES comprises 19 items divided in the subscales of recognition (to which extent SU is perceived as problematic, ambivalence (being undecided concerning own SU) and taking steps (being proactive in working with the problematic SU). Answer alternatives range from strongly disagree (1) to strongly agree (5). The cut-off scores for recognition, ambivalence and taking steps are  $\geq 32$ ,  $\geq 15$  and  $\geq 33$ , respectively. Study participants completed one SOCRATES for each substance they considered as problematic.

The short version of the World Health Organization QoL questionnaire (WHOQOL-BREF) was utilized to measure QoL (The WHOQOL Group, 1998). This is a 26-items self-report deriving from the original version, the WHOQoL-100. The first two items in the WHOQoL-BREF are questions about the overall QoL and overall health and are analyzed separately. The remaining 24 items encompass four domains: physical health (domain 1), psychological health (domain 2), social relations (domain 3) and environment (domain 4). Answer alternatives are rated in a five-point Likert scale. Items 3, 4 and 26 have to be reversed. Domain scores are obtained by first calculating the mean scores of the items within each domain. Next, mean scores are transformed when multiplied by four. The transformed domain scores range from 4 to 20, which allow a comparison with the original version. Higher scores signify higher QoL (The WHOQOL Group, 1998).

Self-reported hereditary aspects were collected. Study participants were asked for a possible history of ADHD diagnosis, SU and/or mental problems among their consanguineous relatives (first and second-degree relatives) in a questionnaire form.



### **3.2.3. Qualitative interviews**

An interview guide comprising open-ended questions was elaborated by the leaders of the ReStart unit and the PhD-candidate. The topics covered in these interviews were 1) the positive and negative aspects of each substance SUD patients considered having problems with, 2) treatment goals related to each SU they considered as problematic and 3) other (non SU-related) treatment goals. However, the results reported in paper II represent the first and second interview topic. Example templates of the interview guide are shown in appendix 1, paper II.

#### **Procedure**

During SUD treatment study participants in the Restart unit were interviewed by the clinician with whom they had collaborated most closely or, depending on time constraints, by the PhD candidate. All study participants from the Færingen unit were interviewed by the PhD candidate.

The follow-up interviews were most frequently conducted by those clinicians whom study participants collaborated the closest with or by the candidate. Whenever study participants considered it as viable, they pointed a contact person within their public support system to carry the follow-up interviews. Given that this was a naturalistic study, in such cases the contact persons were instructed to conduct the interviews as they usually interacted with the study participants.

Guidelines were provided both for study participants, clinicians and contact persons (Appendix 1).

### **3.3. Data analyses**

#### **3.3.1. General statistics Papers I-III**

Descriptive statistics (mean, standard deviation, median and range) for scale and continuous data, as well as for categorical data (percentages) were calculated for the whole SUD group as well as separated by ADHD status (SUD+ADHD vs SUD-ADHD). The SUD groups were compared conducting *t*-tests or Mann-Whitney tests for scale data and chi-squared test or Fishers' exact test for proportions. For the statistical analyses SPSS v.22 (IBM Corp., 2013) and the statistical computing language R (R Core Team, 2015) were utilized. Internal consistency reliability of Cronbach's alpha was calculated for all scales. In papers I and III, findings were considered statistically significant when  $p \leq .01$  and as tendencies when  $p \leq .05$ , due to the multiple testing.

#### **3.3.2. Statistics Paper I**

In paper I, the TCI (measuring personality) and SOCRATES (measuring readiness to change) were utilized. The Cronbach's alpha coefficients for the TCI dimensions ranged between 0.74 (novelty-seeking) and 0.88 (harm-avoidance). Concerning the SOCRATES, SUD patients were asked to complete one questionnaire for each substance they considered as problematic. The Cronbach's alphas for the subscale of recognition were between 0.85 and 0.94, for ambivalence between 0.37 and 0.88 and for taking steps they ranged from 0.82 to 0.95.

The results obtained from the tests of intergroup differences were adjusted for age and presence of mood disorders. Additionally, analyses were adjusted for self-reports of SU/psychiatric problems and a diagnosis of ADHD in blood-related relatives conducting multiple or logistic regression analyses. Since there were repeated SOCRATES questionnaires within individuals, a mixed model was conducted. Individual was entered as random factor,

whereas generic group and ADHD diagnosis were entered as fixed factors. For this mixed model, the R-function `lmer()` in package `lme4` (Bates, Maechler, Bolker, & Walker, 2015; R Core Team, 2015) was conducted.

Effect size (Cohen's *d*) (Cohen, 1988) was calculated to obtain the magnitude of the differences between SUD+ADHD and SUD-ADHD patients. Effect size ranges from 0 to 1, in which a higher value indicates a higher strength of the difference (Cohen, 1988).

### **3.3.3. Qualitative data analysis Paper II**

In paper II, complete interview data from 12 SUD+ADHD patients and a subsample of 10 SUD-ADHD patients matched by age and SU severity was analyzed following the four steps in manifest content analysis, as shown in Appendix 2 (Bengtsson, 2016).

Decontextualization consisted of an open-coding of the data. The open coding process was conducted several times by two of the authors in parallel. The codes were entered in a log book, which was updated every time these were reviewed. To improve reliability, a third author reviewed the codes in relation to the original text. Additionally, inter-rater reliability was calculated (Hallgren, 2012). Recontextualization consisted of a revision (performed by two authors) of the final codes. Only data relevant to the research questions were included. Categorization (conducted by three of the authors) consisted of creating categories by grouping those data codes displaying similar patterns. Codes were rearranged whenever considered appropriate. Descriptions of the categories were created from the data (Bengtsson, 2016; Elo & Kyngas, 2008) and discussed upon by three of the authors, until consensus was obtained. Compilation consisted of reviewing categories and codes in relation to the original text. To increase validity, this process was executed twice; first by two authors in parallel and a second time by a third author. Overviews of frequency endorsements of the codes and categories for each study participant were created.

### 3.3.4. Statistics Paper III

In Paper III, QoL was measured by the WHOQoL-BREF. In this study, only QoL data from the 12-month follow-up after SUD treatment is presented (which will be named as follow-up in subsequent text). The Cronbach's alpha coefficients for the four QoL domains at baseline were between 0.71 for social relations and 0.84 for environment. At follow-up, these were between 0.68 for social relations and 0.89 for psychological health. The Cronbach's alpha coefficients for the ASRS were 0.86 for part A and 0.90 for part B at baseline. At follow-up, the corresponding numbers were 0.84 and 0.86, respectively. For the AUDIT, the Cronbach's alpha coefficients were 0.94 at both observation times. For the DUDIT these were 0.98 at baseline and 0.96 at follow-up.

Indicators of drop-outs were investigated in all participants who initially consented to participate ( $n = 103$ ) by conducting a survival analysis (Cox proportional hazard model). The time in days from baseline to the date of participants' follow-up appointment, date of drop-out or date of death (whichever occurred first) were recorded. Survival times for participants who did not drop-out were recorded as censored.

When comparing the QoL of the SUD patients with a Norwegian population sample (NPS), non-parametric statistics (Mann-Whitney  $U$  and Fisher's exact tests) were applied. SUD patients vs the NPS were compared conducting a one-sample  $U$ -test. A two-sample  $U$ -test was used to compare SUD+ADHD vs. SUD-ADHD. The R functions `wilcox.test`, `fisher.test`, `glm`, and `coxph` (in the survival package) were utilized.

#### **4. Ethical considerations**

Those SUD patients consenting to participate signed an informed consent. Numeral IDs were generated. The signed consents were kept in a safe apart from the IDs. Patients were informed that participation was voluntary and that it was possible to withdraw at any time without providing a reason and that not participating in the study would not affect their SUD treatment in any way. However, there are important ethical considerations when investigating individuals in a vulnerable situation. There is the risk that they may felt obliged to participate for instance, by direct or indirect influence from the staff or the support system close to them. Similarly, it is possible that participants answered in a specific way to seek acceptance from others.

The everyday life of individuals with SUD and/or ADHD can be subject to frequent difficulties and unexpected events affecting participation at follow-up, e.g., acute illness/accident, SU episodes, economic problems, etc. In such cases, the follow-ups were set secondary to the individual's immediate needs. Study participants were channeled to the appropriate care in their support system. No information on compensation was provided. Participants completing the last follow-up received a book (to a value of 200 Norwegian crowns).

## **5. Results**

This study comprised 103 SUD patients (76 men, 27 women) with a mean age  $43.3 \pm 11.1$ . Twenty-four of the 103 study participants had been assessed for ADHD, 90% during adulthood. Most assessments were carried out in adult psychiatric clinics and SUD treatment clinics. The SUD+ADHD group comprised 16 patients (thereof two women). The SUD-ADHD group consisted of 87 SUD patients without an ADHD diagnosis. The SUD groups showed similar distribution concerning education, income, occupational status and housing conditions (paper I). The SUD samples reached at follow-up (paper III) were more frequently males and less frequently employed than the NPS. SUD-ADHD patients were less likely to have a cohabitant and to complete education than the NPS. In the following, the main findings from the research questions in addition to the clinical characteristics of each paper are presented.

### **5.1. Paper I**

Exploring Personality and Readiness to Change in Patients With Substance Use Disorders with and without Attention Deficit Hyperactivity Disorder.

In paper I, SUD+ADHD and SUD-ADHD patients were compared concerning personality (as measured by TCI) and readiness to change (as measured by SOCRATES) (Flores-Garcia, Ytterstad, Lensing, & Eisemann, 2016). Regarding personality, SUD+ADHD patients reported significantly lower harm avoidance (temperament dimension), in the subdimension of fear of uncertainty (e.g., feeling at ease in new situations), compared to SUD-ADHD patients ( $p < .01$ ). Additionally, SUD+ADHD patients showed tendencies of higher ( $p < .05$ ) self-transcendence (character dimension), in the subdimension of self-forgetfulness (e.g., creativity, mind-wandering) than SUD-ADHD patients. Remarkably, for the four persistence subdimensions (eagerness to effort, ambition, work hardened and perfectionism),

SUD+ADHD patients reported higher scores only on eagerness to effort ( $p < .01$ ) (e.g., eager to initiate new projects) and ambition ( $p < .05$ ) (e.g., aiming high) (Supplementary Table 1, paper I) compared to SUD-ADHD patients.

In regards to readiness to change, SUD+ADHD patients reported tendencies of lower recognition of having problematic SU ( $p < .05$ ) more frequently than SUD-ADHD patients. No differences were found between the SUD groups in the SOCRATES scales of ambivalence and taking steps.

#### Clinical characteristics

SUD+ADHD patients were younger ( $37.4 \pm 8.5$  vs  $44.4 \pm 11.2$ ,  $p < .05$ ) and reported a higher symptom burden of ADHD (ASRS part A  $17.4 \pm 4.6$  vs  $11.5 \pm 5.7$ ,  $p < .01$ ; part B  $32.1 \pm 7.3$  vs  $22.6 \pm 9.8$ ,  $p < .01$ ) than SUD-ADHD patients. Compared to SUD-ADHD patients, amphetamine SUD was more prevalent (56.2% vs 24.1%,  $p < .05$ ) and alcohol SUD the least prevalent (37.5% vs 72.4%,  $p < .05$ ) among SUD+ADHD patients.

SUD+ADHD patients reported more frequently than SUD-ADHD patients ADHD (50.1% vs 10.3%) as well as SU problems (56.3% and 33.3%) among first and second degree family members.

## **5.2. Paper II**

Positive and negative aspects of substance use and treatment goals among substance use disorder patients with and without attention deficit hyperactivity disorder: A qualitative study.

In Paper II, SUD+ADHD and SUD-ADHD patients' perceptions of the positive and negative aspects of SU as well as treatment goals were investigated (Flores-García, Lensing, Bjerke, Kvalnes, & Eisemann, 2019). Data were analyzed conducting content analysis. Kappa coefficients were  $> .65$  across all categories.

The following categories on the positive aspects of SU emerged: self-regulation of physical health, behavior, feelings and reasoning/thoughts, and the rewarding effects. The categories encompassing the negative aspects of SU were: consequences on physical health, behavior, feelings, and reasoning/thoughts.

Both SUD groups perceived similar positive and negative aspects of SU. However, contrary to SUD-ADHD patients, SUD+ADHD patients less frequently named physical health as either a positive or negative aspect of SU. In addition, SUD+ADHD patients more frequently than SUD-ADHD patients regarded self-regulation of behavior as a positive aspect of SU.

Treatment goals were categorized as total abstinence, conditional abstinence, substance reduction and unspecified. SUD+ADHD patients less commonly chose treatment goals of total abstinence than SUD-ADHD patients. Additionally, SUD+ADHD patients' treatment goals were more variable (i.e. fell into the different categories), also when multiple SU was involved. On the other hand, treatment goals among SUD-ADHD patients were less variable also in cases of multiple SU. Unspecified treatment goals were common in both SUD groups.

#### Clinical characteristics

Mann-Whitney *U*-tests revealed no significant age differences between SUD+ADHD and SUD-ADHD patients ( $39.1 \pm 8.5$  vs  $33.5 \pm 10$ ,  $p = .156$ ). The SUD groups were comparable in alcohol (AUDIT  $15.5 \pm 12.7$  vs  $21.6 \pm 15.5$ ,  $p = .234$ ) and other (non-alcohol) SU (DUDIT  $20.3 \pm 16.8$  vs  $28.1 \pm 16.8$ ,  $p = .246$ ). Psychiatric comorbidity was frequent in both SUD groups.



### 5.3. Paper III

Quality of Life in Substance Use Disorder patients with and without Attention Deficit Hyperactivity Disorder 12 months after treatment: a naturalistic follow-up study.

Thirty-six SUD patients were located at follow-up, eight SUD+ADHD patients and 28 SUD-ADHD patients (mean age  $41.5 \pm 7.9$  vs  $49.5 \pm 9.5$ ,  $p < .05$ ). The QoL (measured by WHOQoL-BREF) of the 36 SUD patients at baseline and follow-up was compared with QoL (cross-sectional data) from a NPS. In addition, the QoL between SUD+ADHD and SUD-ADHD patients at baseline and follow-up vs the NPS was compared (Flores-Garcia, Lensing, Ytterstad, & Eisemann, 2019).

At baseline as well as at follow-up, the SUD group (36 SUD patients) showed significantly lower QoL in all domains ( $p < .000$ ) compared to the NPS.

When analyzed by ADHD group membership, SUD+ADHD patients and SUD-ADHD patients showed lower QoL ( $p < .05$  and  $p < .000$ , respectively) compared to the NPS. However, the QoL among SUD+ADHD patients had improved at follow-up, and differences ( $p < .05$ ) between this patient group and the NPS were observed only in physical health. The QoL between the SUD+ADHD and SUD-ADHD patients did not statistically differ at baseline or follow-up. Finally, the QoL among SUD-ADHD patients did not change at follow-up, remaining significantly lower ( $p < .01$ ) compared to the NPS.

#### Clinical characteristics

At baseline, SUD+ADHD patients reported higher ADHD symptomatology (ASRS part A  $16.4 \pm 4.7$  vs  $11.0 \pm 5.3$ ,  $p < .05$ ; part B  $32.1 \pm 7.2$  vs  $23.1 \pm 8.0$ ,  $p < .05$ ) than SUD-ADHD patients. Concerning SU at baseline, SUD+ADHD patients reported lower alcohol use (AUDIT  $14.2 \pm 13.0$  vs  $24.9 \pm 10.7$ ,  $p < .05$ ) than SUD-ADHD patients. The SUD groups were

comparable to other (non-alcohol) SU (DUDIT  $15.5 \pm 13.9$  vs  $10.5 \pm 15.6$ , n.s.). Comorbid psychiatric disorders were more prevalent among SUD-ADHD patients.

At follow-up, no differences between SUD+ADHD and SUD-ADHD patients were found on ADHD symptomatology (ASRS part A  $10.8 \pm 4.3$  vs  $9.7 \pm 4.6$ ,  $p=.632$ ; part B  $20.0 \pm 5.8$  vs  $18.9 \pm 7.0$ , n.s.). Further, no differences in SU were found between SUD+ADHD and SUD-ADHD patients (AUDIT,  $8.6 \pm 7.9$  vs  $14.0 \pm 12.1$ ,  $p=.248$ , DUDIT  $5.4 \pm 5.5$  vs  $4.9 \pm 10.4$ , n.s.). Thirty four percent of the SUD sample originally recruited were reached at follow-up. At baseline five of eight SUD+ADHD patients were treated with central stimulants (CSs) and seven out of eight SUD+ADHD at follow-up. No information concerning long-time adherence was collected. Survival analysis showed that being young and having a cohabitant increased the risk for drop-out. Five male SUD-ADHD patients (most with AUDs) had died during the follow-up period.

## **6. Discussion of the main findings**

We compared SUD+ADHD patients to SUD-ADHD patients concerning personality, SU-related aspects and QoL. The clinical characteristics of the study population are presented first, followed by a discussion of the aims of the study, including relevant research after this study was designed.

### **6.1. Prevalence of ADHD among SUD patients and clinical characteristics**

The prevalence of ADHD among SUD patients in this naturalistic study was 15.5%. SUD+ADHD patients were younger, had more frequently amphetamine SUD and less frequently alcohol SUD than SUD-ADHD patients. Psychiatric comorbidity was less frequent in SUD+ADHD patients compared to SUD-ADHD patients.

Previous research suggests that the prevalence of adult ADHD among SUD patients depends on factors such as the type of the assessment instruments used (van Emmerik-van Oortmerssen et al., 2012). In addition, factors such as type of substance, outpatient/inpatient setting (Crunelle et al., 2018; van de Glind et al., 2014) and socio-cultural aspects influencing the recognition of SUD and ADHD (Slobodin & Crunelle, 2019) may complicate the identification of ADHD among SUD patients. In the later years, studies utilizing similar assessments in large study samples have found a prevalence of ADHD among SUD patients of 15-32% (Roncero et al., 2015; van de Glind et al., 2014; van der Burg, Crunelle, Matthys, & van den Brink, 2019). Our findings on prevalence harmonize with this body of research. The lower rates of psychiatric comorbidity found in SUD+ADHD patients compared to SUD-ADHD patients was contrary to the reported from the literature on SUD+ADHD (van Emmerik-van Oortmerssen et al., 2014). This finding suggests that the SUD+ADHD group in the present study had a lower psychiatric symptom burden compared to samples reported in previous studies. Consequently, the present findings may be limited to SUD+ADHD patients with less psychiatric comorbidity.

Concerning the type of substance of preference, research has been inconsistent. High prevalence of ADHD has been reported among patients with AUDs non-alcohol SUDs, stimulant SUDs as well as among those with no particular SU patterns (Biederman et al., 1998; Carroll & Rounsaville, 1993; Konstenius et al., 2014; Ohlmeier et al., 2008; van Emmerik-van Oortmerssen et al., 2012). In the present study, most SUD+ADHD patients were diagnosed with amphetamine SUD. Stimulant addiction among SUD+ADHD patients has been reported in other Norwegian studies (Abel, Bramness, & Martinsen, 2014; Bachmann, Espegren, & Willesen, 2008). In general, the literature concerning the substance of preference among SUD+ADHD patients is still discordant, reflecting the complexity and heterogeneity of this patient group.

Taken together, our findings concerning prevalence rates of ADHD in SUD settings, younger age among SUD+ADHD patients compared to SUD-ADHD patients and to some extent concerning the type of substance of preference, support the existent literature. Nevertheless, contrary to the literature, psychiatric comorbidity was less frequent among SUD+ADHD patients compared to SUD-ADHD patients.

## **6.2. Personality**

When investigating personality as measured by the TCI (Cloninger et al., 1994) we found some differences between SUD+ADHD and SUD-ADHD patients. SUD+ADHD patients showed lower fear of uncertainty (harm avoidance) and higher self-forgetfulness (self-transcendence) than SUD-ADHD patients. Interestingly, of the four persistence subdimensions i.e., eagerness to effort, ambition, work hardened and perfectionism, SUD+ADHD patients reported higher scores on eagerness to effort and ambition only, compared to SUD-ADHD patients. Few studies have investigated personality among SUD+ADHD compared to SUD-ADHD individuals after the present study was designed. A recent review on ADHD and personality found that high novelty seeking, high harm

avoidance and low persistence were the most frequently reported personality traits among individuals with ADHD, when compared to different study samples (Pinzone et al., 2019). Only two of the 15 included studies in the review considered ADHD individuals with SU problems; one among individuals with additional SUDs and another among daily smokers (Sizoo et al., 2009; Sousa et al., 2011). In these studies, SUD+ADHD individuals and smokers+ADHD reported higher novelty seeking than the non-comorbid comparison group (Sizoo et al., 2009; Sousa et al., 2011). Additionally, in the nicotine study, smokers+ADHD showed lower harm avoidance compared to smokers-ADHD. Our findings of low fear of uncertainty (a subdimension of harm avoidance) in SUD+ADHD patients were similar to the nicotine use study (Sousa et al., 2011). Nevertheless, results from the present study on this personality trait cannot be compared to the nicotine study due to differences in nicotine addiction vs other substances (e.g., illicit SU, multiple SU, etc).

Interpreting our findings on personality is challenging since factors such as age may influence its measurement (Fresan, Robles-Garcia, Lopez-Avila, & Cloninger, 2011). For this reason, we adjusted our findings for age. Initially, SUD+ADHD patients showed higher novelty seeking than SUD-ADHD patients. However, these differences disappeared in age-adjusted results. Other factors such as ADHD symptom severity (Salgado et al., 2009), type of substance consumed (Le Bon et al., 2004) and psychiatric comorbidity (Instanes, Haavik, & Halmoy, 2013) may influence (either alone or in conjunction) the measurement of personality as well.

Concerning symptoms of ADHD, some studies have reported a positive association between the temperament trait of persistence and the hyperactive/impulsive symptoms (Gomez, Woodworth, Waugh, & Corr, 2011; Salgado et al., 2009). Accordingly, we hypothesize that SUD+ADHD patients' higher scores on eagerness to effort and ambition are related to the hyperactive/impulsive symptoms of ADHD. For example, individuals with

ADHD may show enthusiasm and engagement in new and different projects as long as they seem interesting, leaving them unfinished as they become tedious (APA, 1994; WHO, 1992).

Another explanation of our findings may be the impact of the different types of SU on personality, as some studies have reported (Le Bon et al., 2004). High harm avoidance has been observed among individuals with benzodiazepine SUDs and AUDs (Evren et al., 2007; Monras et al., 2008) and high self-transcendence and self-forgetfulness in individuals with amphetamine and benzodiazepines SUDs (Gerdner, Nordlander, & Pedersen, 2002). The majority of SUD+ADHD patients in the present study were diagnosed with amphetamine SUD. According to the literature on SUD and personality it is likely that the stimulant effects of amphetamines are associated with SUD+ADHD patients' reports on high eagerness to effort, ambition (subdimensions of persistence) and self-forgetfulness (subdimension of self-transcendence). Similarly, SUD-ADHD patients were more frequently diagnosed with AUD and reported a higher fear of uncertainty (a subdimension of harm avoidance). The effects of alcohol use may have been associated with this result.

Psychiatric comorbidity is another important factor to consider in the assessment of personality. A study reported changes when assessing personality among individuals with ADHD before and after considering psychiatric comorbidity (Instanes et al., 2013). In the present study, initial analyses were adjusted for mood disorders. Findings were similar to those obtained from age-adjusted analyses, indicating that in the present sample, adjusting for mood disorders had an impact on the assessment of personality in SUD+ADHD and SUD-ADHD patients.

In line with previous studies (Abbate-Daga, Amianto, Rogna, & Fassino, 2007; He, Antshel, Biederman, & Faraone, 2015; Kim et al., 2017), both SUD groups reported low self-directedness and cooperativeness, which have consistently been associated with

psychopathology (He et al., 2015; Hosak, Preiss, Halir, Cermakova, & Csemy, 2004; Kim et al., 2017), whereas high scores on these character dimensions indicate maturity (Cloninger, 2004; Cloninger & Zohar, 2011).

In sum, the present findings should be interpreted with caution due to scarce research on personality among individuals with SUD+ADHD, the small sample size and uncontrolled factors which may have influenced our findings. Nevertheless, the differences and similarities in personality between SUD+ADHD and SUD-ADHD patients may be clinically useful. The improvement of patients' self-directedness and cooperativeness can be reached through working on specific temperament styles (Cloninger, 2004).

### **6.3. Substance use-related aspects**

Substance use (SU)-related aspects were investigated using quantitative and qualitative data. Readiness to change was investigated utilizing the self-report questionnaires SOCRATES (subscales of recognition, ambivalence, taking steps). Perceptions on the positive and negative aspects of SU and treatment goals were investigated conducting qualitative interviews.

At the time this study was conducted there was scant published research on readiness to change, the SU perceptions and treatment goals among SUD+ADHD patients. Fortunately, studies considering SUD+ADHD individuals' SU perceptions are increasing. These will be discussed in relation to our findings on SU perceptions, in section 6.3.2.

#### **6.3.1. Readiness to change**

Our finding on SUD+ADHD patients' lowered recognition of having a problematic SU (readiness to change subscale) is in line with a study comparing adolescents with SUD+ADHD by Tamm, Adinoff, Nakonezny, Winhusen, and Riggs (2012). They observed that SUD+ADHD individuals reported a low readiness to change as measured by the

University of Rhode Island Change Assessment (Tamm et al., 2012), particularly those with high degree of inattention symptoms. Adults with ADHD have reported more persistent inattention symptoms than hyperactivity/impulsivity symptoms (Kessler et al., 2010).

It is suggested that appropriate cognitive functioning is necessary in the process of change (Le Berre et al., 2012). As cognitive dysfunctioning is frequent in ADHD (Sonuga-Barke, Cortese, Fairchild, & Stringaris, 2016; Uchida, Spencer, Faraone, & Biederman, 2015), we hypothesize that a lowered recognition of having a problematic SU in SUD+ADHD patients was associated with faulty cognitive functioning.

### **6.3.2. Positive and negative aspects of SU**

Compared to SUD-ADHD patients, SUD+ADHD patients frequently regarded SU as positive to self-regulate behavior and seldom associated the SU effects with physical health. Otherwise, both SUD groups had similar perceptions concerning the positive and negative aspects of SU and in their feelings, thoughts/reasoning as well as for the rewarding effects. The latter was a positive aspect only.

SUD+ADHD patients' perceptions of the self-regulating effects of SU are in line with recent studies on young SUD+ADHD individuals suggesting that they use substances to regulate their emotions, to self-medicate SUD and ADHD symptoms such as impulsivity (Mitchell et al., 2017; Young et al., 2017) and to feel normal (Nehlin, Nyberg, & Oster, 2015). Additionally, SUD+ADHD patients' reports of SU for the rewarding effects (e.g., to get high/drunk) are in line with findings in SUD+ADHD (Young et al., 2017) and among SUD individuals without ADHD (Wilens et al., 2007).

A recent review suggested that there are different aspects of impulsivity in both SUD and ADHD such as sensation seeking, impulsive action and impulsive choice (Ortal et al., 2015). Accordingly, sensation seeking is associated with a proneness to seek for highly



stimulating experiences. Impulsive action implies difficulties suppressing unwanted behavior until it is timely appropriate (longer reaction time) (Ortal et al., 2015), such as task-shifting difficulties, unintentionally interrupting others, etc. Impulsive choice refers to decision-making based on the immediacy and intensity of the reward, instead of considering the long-term gains and losses (Ortal et al., 2015). With respect to these different aspects of impulsivity, it is unclear to which degree our findings of SUD+ADHD patients perceiving SU as positive for self-regulation of behavior were related to impulsive action, impulsive choice or both. Furthermore, SUD+ADHD and SUD-ADHD patients' reports of rewarding effects of their SU may be associated to sensation seeking, a construct corresponding to Cloningers' definition of novelty seeking (McCourt, Gurrera, & Cutter, 1993).

The results on the positive and negative aspects of SU suggest that SUD+ADHD patients perceived more advantages than disadvantages of SU, particularly concerning self-regulation of behavior.

### **6.3.3. Treatment goals**

SUD+ADHD patients less frequently preferred treatment goals of total abstinence and showed more variable treatment goals patterns than SUD-ADHD patients. Given the previously mentioned results on readiness to change and SU perceptions, the results on treatment goals are not surprising. These results are further in line with research indicating that SUD patients set treatment goals according to their own perception of SU severity (Lozano et al., 2015).

To our knowledge, no studies have investigated treatment goals among SUD+ADHD patients. Results from a qualitative study on personal recovery suggested that SUD+ADHD patients prefer total abstinence goals (Kronenberg, Verkerk-Tamminga, Goossens, van den Brink, & van Achterberg, 2015). However, SU-related treatment goals were not directly

investigated. It is suggested that SUD patients can successfully achieve their treatment goals when they choose those by themselves (van Amsterdam & van den Brink, 2013) and that both goals of total abstinence (Bujarski, O'Malley, Lunny, & Ray, 2013) and of substance reduction can work depending on how severe the patients consider their SU (Davis & Rosenberg, 2013; Lee & Zerai, 2010; van Amsterdam & van den Brink, 2013). On the other hand, setting SU-related treatment goals may be complex due to ambivalence, common in individuals with SUD (Carey, Maisto, Carey, & Purnine, 2001; Coulson, Ng, Geertsema, Dodd, & Berk, 2009). Notably, both SUD groups reported unspecified treatment goals, which may have been related to ambivalence towards SU at the time the interviews were conducted.

In sum, the findings on the SU-related aspects suggest that there were some differences in how SUD+ADHD patients related to their SUD compared to SUD-ADHD patients. These findings were possibly due to the fact that SUD+ADHD patients were diagnosed in their adulthood and some of them were newly diagnosed as having ADHD. The function SU has had in their lives (e.g., as a coping strategy) for several years may be different from those diagnosed and treated for their ADHD earlier in life. This hypothesis is worth further research.

#### **6.4. QoL**

The data analysis on QoL as studied by the WHOQoL-BREF revealed that when compared with the NPS, all SUD patients reported a lowered QoL at baseline and follow-up. This was in line with previous studies comparing general population samples among individuals with either SUD or ADHD (Lensing, Zeiner, Sandvik, & Opjordsmoen, 2015; Macfarlane, Prentice, & Walsh, 2019; Vederhus, Birkeland, & Clausen, 2016). When investigated as a function of ADHD diagnosis, SUD+ADHD patients reported an improved QoL from baseline to follow-up compared to SUD-ADHD patients' unchanged QoL. SUD+ADHD patients' QoL scores were in between SUD-ADHD patients and the NPS. This

finding was unexpected, as previous studies have shown that individuals with SUD and psychiatric comorbidity tend to report a reduced QoL compared to SUD patients without psychiatric comorbidity (Mazza et al., 2009; Saatcioglu, Yapici, & Cakmak, 2008). There is scarce research on the QoL of SUD+ADHD patients as compared to SUD-ADHD patients. Cross-sectional studies comparing the QoL between SUD+ADHD and SUD-ADHD patients have observed either a similarly low (Kronenberg, Goossens, van Etten, van Achterberg, & van den Brink, 2015) or lower QoL (Umar, Salihu, & Owolabi, 2017) among SUD+ADHD patients.

Although the impact of treatment on the QoL among SUD+ADHD patients was beyond the scope of the present study, it should be noted that psychopharmacological treatment has been associated with improved ADHD symptomatology and QoL (Adler et al., 2013; Coghill, 2010). Furthermore, Brod et al. (2006) found that having been diagnosed earlier in life was associated with a satisfactory QoL among adults with ADHD. In the present study, SUD+ADHD patients were diagnosed in their adulthood and seven out of eight were under CS treatment at follow-up. Possibly, these factors positively influenced SUD+ADHD patients' QoL over time. Nevertheless, little is still known about the long-term effects of psychopharmacological treatment in the QoL among SUD+ADHD patients. Other factors such as the type of SU or self-report issues may explain our findings on QoL.

Most SUD+ADHD patients were diagnosed with amphetamine SUD and SUD-ADHD patients with AUD. It is suggested that there are different degrees of harm depending on the type of substance of consumption e.g., alcohol is the most harmful substance (Nutt et al., 2010). An explanation for SUD+ADHD patients' improved QoL as compared to SUD-ADHD patients' unchanged QoL may be that the consequences of alcohol use were greater compared to amphetamine use in the life domains measured by the WHOQoL-BREF. For instance, in the present study, most of those who had died consumed alcohol. A relationship between

death and alcohol abuse among SUD patients has been reported previously (Landheim, Bakken, & Vaglum, 2006). Alternatively, the present findings of improved QoL in SUD+ADHD patients may be interpreted in light of an over optimism, sometimes observed in ADHD (Knouse & Mitchell, 2015; Owens, Goldfine, Evangelista, Hoza, & Kaiser, 2007). However, there is also evidence that self-reports from individuals with ADHD are reliable (Kooij et al., 2019; Kooij et al., 2008). As QoL is subjective, other unknown factors could have played a role in the present findings.

## **6.5. Methodological considerations**

One of the challenges with naturalistic studies is the presence of several uncontrolled variables, potentially affecting the results, e.g., concerning the data collection, selection bias, measurements and data analysis.

### **6.5.1. Data collection**

Study participants completed the self-report questionnaires and interviews during the course of SUD treatment, commonly within the first weeks. However, this was variable for each participant. Additionally, the settings at follow-up (mail, telephone, polyclinic, short readmissions, home visits, and public office) were individually agreed upon with participants, and when applicable, with the contact person in the public (local) support system, chosen by each participant. The follow-ups were not always conducted as scheduled, e.g., for reasons such as important changes in participants' living situation, new treatment episodes and practical reasons. Furthermore, participants were offered reading and writing assistance during treatment and at follow-up by clinicians, the PhD candidate and the contact person in the public support system. Written instructions were developed, specifically addressing study participants, clinicians and participants' local contact persons (Appendix 1). In addition, instructions were delivered verbally. Nevertheless, we cannot rule out that questions might

have been interpreted in different ways, under different circumstances, influenced by the presence of different assistants.

The presence of different interviewers in the qualitative study might also have influenced participants' answers concerning the SU-related treatment goals and due to social desirability bias. The latter refers to the wish for acceptance by acting in social desirable ways (Crowne & Marlowe, 1964). For instance, participants' treatment goal choices of total abstinence might have resulted from social desirability. Although matching SUD patients and clinicians is a TAU procedure in the ReStart unit, social desirability might have been present during the data collection. As an attempt to minimize this problem, whenever possible, study participants were free to collaborate with a contact person in their already existing public support system whom they were comfortable with.

On the Færingen unit, participants were recruited by a contact person in the last two months of the inclusion period. In this case, only the PhD candidate provided assistance and conducted the qualitative interviews. The follow-ups for the study participants from this unit were limited to postal, telephone or polyclinic.

Importantly, participants completed the same self-report questionnaires during SUD treatment and follow-up. They were additionally interviewed concerning treatment goals at follow-up. In some cases, it was natural to discuss the answers from the previous observation time (three, six and 12 months after SUD treatment) and feedback on preliminary results was provided whenever participants required it. Such discussions might have influenced patients' answers as well. Nevertheless, discussions on patients' status since the last contact with the ReStart unit is a TAU procedure.

Other methodological considerations relate to recall problems and reliability of self-reports, e.g., in longitudinal studies (Blome & Augustin, 2015). Nevertheless, validity and

reliability of self-reports in SUD research do not appear to represent a major issue (Darke, 1998). Furthermore, although individuals with ADHD may under-report their ADHD symptoms (Barkley et al., 2002; Young & Gudjonsson, 2005) they still are likely to provide reliable self-reports (Kooij et al., 2008).

### **6.5.2. Selection bias**

Selection bias may have been present at different stages of this study. Research indicates that only a minority of individuals with SUDs seek treatment (Alonso et al., 2004; Grella et al., 2009). The results in the present study therefore apply to SUD treatment seekers. In addition, participants were recruited from two different SUD treatment units. Although the type of treatment intervention was not in the scope of this study, the treatment strategies in the Restart (motivational interviewing) and Færingen (Therapeutic community) units differed. Consequently, the clinical characteristics of SUD patients in the two units may have differed, as well. Moreover, it is possible that the clinical characteristics of patients willing to participate and completing the follow-ups were more collaborative or more resourceful compared to those who did not want or dropped out. However, as described in the methods section, efforts were made to include all Norwegian-speaking participants as long as no severe mental, behavioral or physical conditions hindered them from participation.

In sum, there was likely a participant self-selection bias in terms of seeking (a specific type of) treatment, being willing to participate and followed up over long time. Although we tried to minimize selection bias by broadening the inclusion criteria, since there were different clinicians recruiting, we cannot rule out selection bias from the recruiters.

The recruitment period lasted a year and a half (February 1st, 2010- July 31st, 2011). Extending the inclusion period might have helped improving the number of SUD+ADHD

patients. Nevertheless, this was not a viable option in terms of the needed time and resources when conducting clinical research under the existent circumstances.

### **6.5.3. Measurements**

The psychiatric interviews for axis I and II disorders and most of the self-report measurements utilized in this study, are widely used in research. In recent years, the ASRS has been assessed as an appropriate screening instrument for ADHD in SUD populations (Crunelle et al., 2018; Luderer et al., 2018; van de Glind, Van Emmerik-van Oortmerssen, et al., 2013) and the WHOQoL-BREF has recently been validated in a Norwegian SUD sample (Muller, Skurtveit, & Clausen, 2019). Otherwise, most of the questionnaires have not been validated in Norwegian populations. Further, we translated the SOCRATES to Norwegian from the Danish version (Heiselberg, Meincke, Henriksen, & Nikolajsen, 2008). The internal consistency reliability of all self-report instruments ranged from acceptable to excellent, except for the subscale of ambivalence in the SOCRATES. However, the coefficients in the ambivalence subscale were comparable to those reported by the authors of the instrument (Miller & Tonigan, 1996). We utilized a Norwegian translation of the TCI's validated Swedish version (Brandstrom et al., 1998) to measure personality.

In the follow-up paper (paper III), we only report results from QoL at 12-month follow-up after SUD treatment. However, we collected data at three, six and 12 months after treatment as well. We made the decision to report the longest observation time available in our study, since it is suggested that QoL reaches stable levels after two years of substantial SU reduction or abstinence (Laudet, 2011). The self-report questionnaires utilized in this study were designed to be answered considering distinct periods of time. For instance, in the case of the AUDIT and DUDIT, the original instruction is to report on SU in the past 12 months (Babor et al., 2001; Berman et al., 2005). In the case of the WHOQoL-BREF and ASRS the original instructions are to report on the QoL in the past two weeks and ADHD symptoms in

the past six months, respectively (Kessler, Adler, Ames, Demler, et al., 2005; Kessler et al., 2007; The WHOQOL Group, 1998). For the purpose of our study, participants were systematically given instructions to complete the questionnaires since the previous observation time. That is to say, at the 12 months follow-up, study participants reported on their SU, QoL and ADHD symptoms since the previous follow-up (the six month follow-up).

In terms of the QoL instrument (WHOQoL-BREF) results indicated that SUD+ADHD patients reported an improved QoL in the domain of social relations (in addition to physical health and environment), which did not significantly differ from the NPS. Nevertheless, the social relations domain comprises only three items (degree of satisfaction with: personal relations, sex life and support from friends) (The WHOQOL Group, 1998). Therefore, caution must be taken when interpreting these results.

Quality control of self-reported questionnaires was conducted by reviewing the data randomly and several times. Errors in the data recording are therefore considered to be minimal. In the ReStart unit, the M.I.N.I-PLUS neuropsychiatric interviews for axis I diagnoses were conducted by clinicians after a short training and revised by the chief psychologist, who decided on the final diagnosis. The SCID II interviews for Axis II diagnoses were conducted by the chief psychologist and only when considered appropriate (TAU). In the Færingen unit, all neuropsychiatric interviews were conducted by the psychologist of the unit.

#### **6.5.4. Data analysis**

In paper I, results were adjusted for age and mood disorders, since previous studies indicate that these variables may have an impact on personality in general and in ADHD (Fresan et al., 2011; Instanes et al., 2013). Findings were additionally adjusted for consanguineous SU problems, psychiatric problems and ADHD, as individuals with ADHD



may present a more adverse family history (Biederman et al., 2008), which may have influenced SUD+ADHD patients' self-reports. Although similar results were obtained in age-adjusted results and the above-mentioned variables, the small sample size did not allow to adjust for CS treatment and type of SU. The literature indicates that these variables might also influence personality in SUD and readiness to change in SUD+ADHD.

In paper II, saturation was not reached concerning the positive and negative aspects of SU in interpersonal factors (social factors, work, legal problems etc.). These are important for the assessment of the social consequences of SUDs (APA, 1994; WHO, 1992). It would have been useful to investigate whether or not SUD+ADHD patients' SU perspectives on interpersonal factors differed from SUD-ADHD patients.

In paper III, we considered adjusting for CS treatment in the SUD+ADHD group, since research suggested that CS treatment may improve QoL in ADHD (Lensing, Zeiner, Sandvik, & Opjordsmoen, 2013) but this was not possible due to the small sample size.

## **6.6. Limitations and strengths**

### **6.6.1. Limitations**

The present study has several limitations at different levels. Firstly, concerning the representativeness of the sample, secondly, concerning the data collection and finally, concerning the measurements and data analysis.

#### **Representativeness of the sample**

The sample size was small, women were underrepresented and the drop-out rate was high. In addition, based on the lower rates of psychiatric comorbidity among SUD+ADHD patients in this study, it is likely that they did not represent individuals with the most severe clinical presentation. Therefore, the present findings cannot be transferable to SUD+ADHD

patients with frequency of high psychiatric comorbidity. Moreover, as the SUD+ADHD patients in this study were diagnosed with ADHD in their adulthood, our findings might not generalize to SUD+ADHD individuals diagnosed earlier in life.

### **Data collection**

Although this was a TAU procedure, only the diagnoses of substance dependence, not substance abuse according to the ICD-10 and DSM-IV, were collected. Assessing SUD patients for potential substance abuse could have been useful for counteracting the development to substance dependence and for assessing the relationship between different substances.

### **Measurements and data analysis**

Due to the small sample size, the relationship of a specific type of substance with personality was not investigated. Further, identifying potential confounders in the measurement of readiness to change was not planned in the study design. Factors potentially associated with SUD patients' readiness to change, such as executive dysfunction, not infrequent in ADHD (Uchida et al., 2015) were not investigated. In addition, due to the multiple SOCRATES questionnaires within individuals and the small sample size, the analyses would have been unviable. There was a lack of information about real-life functioning to supply the QoL results (e.g., work, day activity status).

A number of SUD patients who were not diagnosed with ADHD, reported high ADHD symptomatology, as measured by the screening instrument, ASRS. ADHD symptoms are frequently reported by individuals with SUD (van de Glind, van den Brink, et al., 2013) which might improve over time with reduced SU (Hagen et al., 2017). Nevertheless, we cannot discard the presence of a possible subthreshold ADHD group. Individuals who do not meet the full ADHD diagnosis have consistently been found to have similar life impairments

as those meeting the full criteria (Biederman et al., 2018; Faraone, Kunwar, Adamson, & Biederman, 2009). Information concerning the QoL among subthreshold cases of ADHD would have been relevant to obtain as well.

As in-depth interviews were not conducted, it was not possible to tap substantial information on the intrapersonal and the interpersonal positive and negative aspects of SU and treatment goals. Further, in-depth interviews from SUD+ADHD patients who early dropped out would have been particularly valuable to obtain, in order to understand these patients better and elaborate strategies to prevent attrition. Additionally, non SU-related treatment goals were not included in the study. These could have shed further light on patients' goals related to ADHD symptoms, education, employment as well as to family and social relations. Finally, SUD+ADHD patients were not systematically asked about the relationship between their SUDs and ADHD.

### **6.6.2. Strengths**

One of the strengths of this naturalistic follow-up study is that SUD+ADHD patients were investigated concerning topics in the context of SUD treatment. There are few published studies on SUD+ADHD from this perspective. Additionally, a mixed methods approach was utilized. It was possible to acquire complementary information to self-report questionnaires. When investigating QoL, the SUD groups were compared to data from a NPS. Consequently, SUD patients' self-reports concerning QoL were compared to those of individuals living in a social context with similar welfare opportunities. Additionally, considering that there is limited information on SUD+ADHD patients after SUD treatment, results from the follow-up study allowed following the course of their self-reported QoL, SUD and ADHD symptoms over a reasonably long period of time. In general, the self-report questionnaires utilized in this study are widely used and well established in SUD and ADHD research. Most of the results

from this naturalistic study are in line with the existing literature on SUD+ADHD, which add up to the ecological validity of this study.

## **6.7. Implications**

### **6.7.1. Implications for clinical practice**

Our findings that SUD+ADHD patients' reported some differences compared to SUD-ADHD patients on personality, readiness to change, SU perspectives and QoL suggest that the use of individualized strategies for the treatment of SUD+ADHD is appropriate. Recently, treating SUD and ADHD simultaneously has been recommended (Crunelle et al., 2018). Furthermore, in Norway SUD patients are encouraged to become actively involved in the decision-making of their own SUD treatment (Directorate of health, 2012, 2016a, 2018). As this patient group is heterogeneous (Løvaas & Dahl, 2013), individual differences should be considered. As a recommendation at the initial phase of SUD treatment, psychoeducation about the relationship between SUD and ADHD should be provided to SUD+ADHD patients. Further, the severity of SUDs and ADHD symptoms should be assessed. In the latest version of the DSM, the DSM-5 (APA, 2013) is SUD no longer dichotomized into the categories of substance abuse and substance dependence. Similarly, in the DSM-5, ADHD is assessed as mild, moderate or severe (APA, 2013). Although in Norway, the WHO's ICD-10 is the standard diagnostic manual, whereas the DSM is used as a supplementary diagnostic tool (Directorate of health, 2012), this dimensional approach may be useful when assessing and following-up the course of the severity of SUD and ADHD symptoms among SUD+ADHD patients. Furthermore, assessing the ADHD symptoms is useful when making decisions on psychopharmacological treatment of ADHD (Directorate of health, 2016b).

SUD+ADHD patients' initial assessments of SUD and ADHD symptoms may be followed by the assessment of SU-related aspects (readiness to change and the positive,

negative aspects of SU) and QoL. Additionally, the measurement of personality possibly allows SUD+ADHD patients identifying their personal strengths and challenges. This information can be used for the establishment of realistic (SU- and non-SU related) treatment goals. Our results concerning treatment goals indicate that a concrete guidance may be appropriate to help SUD+ADHD patients establishing treatment goals. Nevertheless, as such assessments are likely to require an important amount of time, they are presumably difficult to implement in a busy daily clinical practice. Furthermore, there is a risk that factors such as a high severity of ADHD symptoms and/or immediate needs to be covered (health-related, housing, economy, etc) overshadow SUD+ADHD patients' engagement in SUD treatment. Misinterpreting a low engagement due to these factors, e.g., as if SUD+ADHD patients are trivializing their SUDs, may negatively affect the therapeutic alliance and increase the drop-out risk (Brorson, Ajo Arnevik, Rand-Hendriksen, & Duckert, 2013). Making efforts to collect the before mentioned information about SUD+ADHD patients is likely to help building a therapeutic alliance, which is essential in SUD treatment (Project Match Group, 1997).

### **6.7.2. Implications for the rehabilitation process (long-term care)**

Both SUD and ADHD are defined as persistent disorders (APA, 2013; WHO, 1992), implying a necessity of long-term care. As the therapeutic alliance is important also in the rehabilitation process (Clausen et al., 2015), SUD+ADHD patients' support system may be in a better position to support patients' rehabilitation process if provided psychoeducation on the SUD+ADHD relationship. Furthermore, providing a status on patients' treatment goals to their support system is likely to create continuity after SUD treatment, also ensuring an appropriate interdisciplinary and interagency collaboration (Ministry of health, 2004) between SUD treatment and SUD+ADHD patients' support system.

A potential challenge in the long-term rehabilitation process is that the interdisciplinary and interagency collaboration for the care of SUD patients may represent a bias, for instance towards the medical strategies, not prioritizing other aspects such as the socio-pedagogical (Schiøtz, 2017) or vice versa. Another challenge might be an underrecognition of ADHD (Asherson et al., 2010; Moncrieff & Timimi, 2010). The moralization of SUD and ADHD is still an important issue to address in the treatment and long-term care of SUD+ADHD patients (Matthys et al., 2014; Matthys et al., 2012). An appropriate assessment and evaluation of SUD+ADHD patients' goals should increase predictability in SUD treatment and continued care.

## **7. Conclusions**

The overall aim of this naturalistic study was to investigate whether SUD+ADHD and SUD-ADHD patients differed in personality, SU-related aspects (readiness to change, SU-perceptions and treatment goals) and QoL. The present findings confirm previous research suggesting that SUD+ADHD patients are younger and prefer non-alcohol substances when compared to SUD-ADHD patients. Our findings additionally confirm previous studies on the prevalence of ADHD among SUD patients. When comparing SUD+ADHD patients with SUD-ADHD patients, we found differences in personality, SU-related aspects and QoL. The assessment of personality may provide SUD+ADHD patients with feedback on their specific strengths and challenges. This information is likely to assist them improving their goal-directed behavior. Our findings concerning the SU-related aspects suggest that SUD+ADHD patients need more thorough help to assess the degree of severity of their SUDs than SUD-ADHD patients. A systematic assessment may provide the bases to establishing realistic and clear SU-related treatment goals. In terms of QoL, although both groups reported SU reduction at follow-up, only SUD+ADHD patients reported an improved QoL. These results indicate that SU reduction alone may not be sufficient to improve QoL. SUD+ADHD patients reported an improved ADHD symptomatology at follow-up. Identifying indicators of functional improvement (determined by patients themselves) in SUD treatment may help to identify the factors associated with an improved QoL over time, which can be considered earlier in treatment. However, in a demanding everyday clinical practice, these interventions require substantial efforts at different levels to be successfully incorporated in the treatment of SUDs. More studies are needed to confirm our findings and investigate what might contribute to a better QoL in SUD+/- ADHD patients. SUD+ADHD and SUD-ADHD patients may benefit from individualized treatment strategies.

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## **Appendix 1 Guidelines for clinicians, study participants and contact persons ( in Norwegian)**

### **Veileder for behandler**

#### **RUS og ADHD: Behandlingsforløp og grad av måloppnåelse**

Hovedhensikten med denne studien er å synliggjøre behandlingsforløp og grad av

måloppnåelse, for pasienter med og uten ADHD. Personer med

rusmiddelproblematikk og ADHD-diagnose (gruppe 1) - og rusmiddelproblematikk uten

ADHD-diagnose (gruppe 2) – blir fulgt opp gjennom et år etter avsluttet rusbehandling.

Personer som starter behandling i perioden mellom februar 2010 og juli 2012 vil fortløpende

inviteres til å delta i undersøkelsen. Utvalget følges opp i tre oppfølgingsmålinger fordelt på 1 år.

Dette vil si at innhenting av data vil avsluttes i september 2013. Deltakerne vil bli studert i lys av følgende variabler:

- personlighet
- psykisk helse
- opplevd kontroll
- endringsprosess
- mestringstillit
- livskvalitet
- depresjon angst
- Rusmønster måles med AUDIT og DUDIT
- ADHD symptomer med ASRS

I tillegg vil det tas høyde for i hvor stor grad pasientene når de mål de har satt seg i forhold til egne målsettinger. Deltakerne vil undersøkes for de overnevnte variabler i flere målinger. Resultat vil gi oss på ReStart bedre innsikt i pasientenes livssituasjon, samt synliggjøre deres utfordringer. Dette vil kunne danne grunnlag for en intervensjon på et senere tidspunkt, med tanke på å legge til rette for optimal individuell rusbehandling.

## Oversikt over Måleinstrumenter

Navn forkortelse	Hva måler det	Administrerings- måte	Tidspunkt det måles	Varighet	Antall Påstander	Til rette- legging
AUDIT	Screening problematisk alkoholbruk	Selvrapporering	Ila beh	5 min	10	
DUDIT	Screening problematisk rusmiddelbruk	Selvrapporering	Ila beh	5 min	11	
DUDIT-E	+ og – ved rusbruk og motivasjon for endring	Selvrapporering	Ila beh	7 min	44	
KKS	Bakgrunnssdata	Intervju	Ila beh	1 t	3 deler, 44 spørsmål	
ASRS	Screening ADHD symptomer	Selvrapporering/ intervju	Ila beh	10 min	18	
ADHD-BAK	Bakgrunnssdata vedr. ADHD	Selvrapporering/ intervju	Ila beh	5 min	10	
TCI	Personlighet	Selvrapporering	Ila beh	20 min	240	
LOC	Opplevd kontroll	Selvrapporering	Ila beh	15 min	50	
SOCRATES	Endringsprosess	Selvrapporering	Ila beh	10 min	19	
GSE	Mestringstillitt	Selvrapporering	Ila beh	5 min	10	
WHOQOL- BREF	Livskvalitet	Selvrapporering	Ila beh	15 min	28	

BDI II	Depresjon	Selvrappotering	Ila beh	3	6	12		15 min	21	
STAI	Angst	Selvrappotering	Ila beh	3	6	12		15 min	40	
MINI-PLUSS	Psykisk helse  (Akse 1 lidelser)	Intervju	Ila beh			12		1 t	26 moduler	
Intervju "Egne målsettinger"	Mål og grad av måloppnåelse	Intervju	Ila beh	3	6	12		1 t	14 spørsmål	

- Dere har nå fått innføring i prosjektets formål og dets framgang.
- Dere har fått opplysning om hvilke måleinstrumenter vi tenker å benytte.
- Vennligst gå gjennom "forespørsel om deltakelse" sammen med pasienten.
- Spør om det er noen uklarheter i den.

Om pasienten takker ja til å være med:

- Forklar hvilke måleinstrumenter som skal tas i løpet av behandlingen. Det er lurt å dele dem i bolker.

Skjemaene for rusmønstre og bakgrunsskjema bør besvares først.

- Det er behandleren som vurderer når pasienten er i god nok form til å delta. Poenget er at pasienten føler seg komfortabel og stabil nok til å kunne svare så ærlig som mulig på spørsmålene. Det finnes ikke fasit eller riktige /gale svar.

- Når det gjelder intervjusituasjonen (KKS, MINIpluss og "Egne målsettinger"), er det en utfordring å være konkret og få ryddig informasjon. Det kan være slik at pasienten noen ganger trenger hjelp til å sortere litt i hva som skal med. Spesielt i intervjuet "egne målsettinger" kan vi hjelpe pasienten med å sortere og ta det som er "øverst på listen".

- Tilrettelegg for besvarelse i samarbeid med pasienten.

- Avtal tid og sted for utfylling av skjemaene, fysiske omgivelsene, etc.

- Det er planlagt at man kan dele ut en gevinst (e.g. gavekort eller lignende) på slutten av deltakelsen. (ikke i begynnelsen). Pasientene skal ikke informeres om gevinst med mindre de spør. Dette er for å unngå at de motiveres til deltakelse av økonomiske grunner.

Oppfølgingsmålinger:

Senest ved siste evaluering av individuell plan/ intervju ”egne målsettinger”.

Vennligst avklar med pasienten besvarelse for neste oppfølgingsmåling. Det er viktig å ha en bevisst holdning til dette, i og med at vi vet at det er greit å svare på spørsmål i beskyttede omgivelser. Det kan være vanskelig å tilrettelegge for bevarelsen i hjemmesituasjonen. Om vi ikke er bevisst på dette kan vi risikere frafall. Oppfølgingsmålinger vil foretas 3, 6 og 12 måneder etter endt klinikkopphold. Man kan enes om tilrettelegging fra gang til gang. For eksempel kan første oppfølgingsmåling foretas under en reinnleggelse? Alternativt kan pasienten besvare på egen hånd. Pasienten bør også kunne få hjelp hos fastlege, ruskonsulent, osv. Dette kan evt. avklares på samarbeidsmøter eller ved annen kontakt med hjelpeapparatet.



# Veileder for pasient

## RUS og ADHD: Behandlingsforløp og grad av måloppnåelse

Hovedhensikten med denne studien er å synliggjøre behandlingsforløp og grad av

måloppnåelse, for pasienter med og uten ADHD. Personer med

rusmiddelproblematikk og ADHD-diagnose (gruppe 1) - og rusmiddelproblematikk uten

ADHD-diagnose (gruppe 2) – blir fulgt opp gjennom et år etter avsluttet rusbehandling.

Personer som starter behandling i perioden mellom februar 2010 og juli 2012 vil fortløpende

inviteres til å delta i undersøkelsen. Utvalget følges opp i tre oppfølgingsmålinger fordelt på 1 år.

Det vil si at innhenting av data vil avsluttes i september 2013. Deltakerne vil bli studert i lys av følgende variabler:

- personlighet
- psykisk helse
- opplevd kontroll
- endringsprosess
- mestringstillit
- livskvalitet
- depresjon angst
- Rusmønstret måles med AUDIT og DUDIT
- ADHD symptomer med ASRS

I tillegg vil det tas høyde for i hvor stor grad pasientene når de mål de har satt seg i forhold til egne målsettinger. Deltakerne vil undersøkes for de overnevnte variabler i flere målinger. Resultat vil gi oss på ReStart bedre innsikt i pasientenes livssituasjon, samt synliggjøre deres utfordringer. Dette vil kunne danne grunnlag for en intervensjon på et senere tidspunkt, med tanke på å legge til rette for optimal individuell rusbehandling.

Vi på ReStart håper at du finner det er nyttig å delta i denne undersøkelsen. Aktiv brukermedvikning er et fint og viktig verktøy som hjelper oss å tilby bedre rusbehandling.

- Du har nå fått informasjon om hva prosjektet går ut på
- Du har nå gått gjennom ”forespørsel om deltakelse” sammen med din saksbehandler
- Hvis du takker ja til å være med i prosjektet, signerer du på samtykkeerklæringen. Du vil få tildelt et ID-nummer, slik at alle opplysninger anonymiseres.
- I fortsettelsen finner du utfyllende informasjon om spørreskjemaene som vil bli brukt i denne studien:

### Spørreskjemaer

Navn forkortelse	Hva måler det	Administrerings- måte	Tidspunkt det måles	Varighet	Antall Påstander
AUDIT	Screening problematisk alkoholbruk	Selvrapportering	Ila beh	5 min	10
DUDIT	Screening problematisk rusmiddelbruk	Selvrapportering	Ila beh	5 min	11
DUDIT-E	+ og – ved rusbruk og motivasjon for endring	Selvrapportering	Ila beh	7 min	44
KKS	Bakgrunnsdata	Intervju	Ila beh	1 t	3 deler, 44 spørsmål
ASRS	Screening ADHD symptomer	Selvrapportering/ intervju	Ila beh	10 min	18
ADHD-BAK	Bakgrunnsdata vedr. ADHD	Selvrapportering/ intervju	Ila beh	5 min	10
TCI	Personlighet	Selvrapportering	Ila	20 min	240

			beh					
LOC	Opplevd kontroll	Selvrapportering	Ila beh	3	6	12		15 min 50
SOCRATES	Endringsprosess	Selvrapportering	Ila beh	3	6	12		10 min 19
GSE	Mestringstillitt	Selvrapportering	Ila beh	3	6	12		5 min 10
WHOQOL-BREF	Livskvalitet	Selvrapportering	Ila beh	3	6	12		15 min 28
BDI II	Depresjon	Selvrapportering	Ila beh	3	6	12		15 min 21
STAI	Angst	Selvrapportering	Ila beh	3	6	12		15 min? 40
MINI-PLUSS	Psykisk helse (Akse 1 lidelser)	Intervju	Ila beh			12		1 t 26 moduler
Intervju egne målsettinger	Mål og grad av måloppnåelse	Intervju	Ila beh	3	6	12		1 t 10 spørsmål

- Det er lurt å besvare skjemaene i bolker. Skjemaene for rusmønstre og bakgrunnskjemaene bør besvares først.

- Før du svarer kan det være lurt å kjenne etter om du føler deg komfortabel og stabil nok til å kunne svare så ærlig som mulig på spørsmålene. Forsøk å jobbe rask uten å tenke for mye på spørsmålene. Det finnes ikke fasit eller riktige /gale svar. Vi vil vite om dine egne opplevelser av din situasjon og dette er jo individuelt.

- Når det gjelder intervjuene (KKS, MINIpluss og ”Egne målsettinger”), kan det være utfordrende å se/ tenke klart rundt egne kortsiktige og konkrete målsettinger. Meningen med intervjuet ”egne målsettinger” er å fokusere på dine kortsiktige mål → dvs. konkrete og gjennomførbare realistiske

mål, som ofte kan være tidsbegrenset. Ofte hjelper det å få bistand til å sortere tankene. Om du har mange ting å ta for deg, lag gjerne en liste – om du vil, gjerne sammen med din saksbehandler / kontaktperson - over ting som er viktig for deg å jobbe med. Sett deretter opp et prioriteringsnummer på disse tingene. Begynn så med de tingene du velger øverst (som er viktigst for deg) i prioriteringslisten din. Det du kommer frem til i intervjuet ”egne målsettinger”, vil være en del av din individuelle behandlingsplan. Du kan evaluere den så ofte som du selv synes er nødvendig.

- Gjør en avtale med din saksbehandler om når og hvordan det passer best for deg å gjennomføre besvarelsen.

#### Oppfølgingsmålinger:

Du vil bli fulgt opp i forhold til dine egne målsettinger over ett år: 3, 6 og 12 måneder etter avsluttet klinikkopphold. Intervjuet ”egne målsettinger” vil tas opp i hver oppfølgingsmåling for å holde en rød tråd i dine mål, tiltak, utfordringer og resurser. Det samme gjelder spørreskjemaene. Det vil være nyttig og se i hvilken grad dine opplevelser forandrer seg over tid.

- For at du skal ha best mulig betingelser når du skal besvare, er det viktig at du og din saksbehandler avtaler rammende rundt neste oppfølgingsmåling der dere avklarer ansvarsområder, tidspunkt, osv. Dette kan for eksempel være i forbindelse med en reinnleggelse, oppfølgingshelg eller lignende. Alternativt kan du få spørreskjemaene pr post og annen i ditt hjelpeapparat bistår deg å tilrettelegge og administrere disse (ruskonsulent, fastlege, etc...) Kan evt. avtales i samarbeidsmøte.

Avtal dette med din saksbehandler senest ved siste evaluering av individuell behandlingsplan/ intervju før du skrives ut.

Vi setter pris på din innsats.

Dine tilbakemeldinger hjelper oss å bli bedre.

Lykke til!

# Veileder for pasientens kontaktperson

## RUS g ADHD: Behandlingsforløp og grad av måloppnåelse

### Prosjektsammendrag

Hovedhensikten med denne studien er å synliggjøre behandlingsforløp og grad av måloppnåelse i forhold til målsetting for pasienter med og uten ADHD. Personer med rusmiddelproblematikk og ADHD-diagnose (gruppe 1) - og rusmiddelproblematikk uten ADHD-diagnose (gruppe 2) – blir fulgt opp gjennom et år etter avsluttet rusbehandling. Personer som starter behandling i perioden mellom februar 2010 og juli 2012 vil fortløpende inviteres til å delta i undersøkelsen. Utvalget følges opp i tre oppfølgingsmålinger fordelt på 1 år. Dette vil si at innhenting av data vil avsluttes i september 2013. Deltakerne vil bli studert i lys av følgende variabler: personlighet (målt med TCI), psykisk helse (målt med M.I.N.I. plus 5.0.0 strukturert intervju) opplevd kontroll (målt med LOC), endringsprosess (målt med SOCRATES), mestringstillit (målt med GSE), livskvalitet (målt med WHOQOL-BREF), depresjon (BDI) og angst (målt med STAI). Rusmønstret måles med AUDIT og DUDIT, og ADHD symptomer med ASRS. I tillegg vil det tas høyde for i hvor stor grad pasientene når de mål de har satt seg i forhold til egne målsettinger. Deltakerne vil testes for de overnevnte variabler i repeterte målinger. Resultat vil gi oss på ReStart bedre innsikt i pasientenes livssituasjon, og synliggjøre deres utfordringer. Dette vil kunne danne grunnlag for en intervensjon på et senere tidspunkt med tanke på å planlegge og legge til rette for optimal individuell rusbehandling.

En kontaktperson i pasientens eksisterende nettverk, er en støttespiller som hjelper til å sikre at pasienten har rundt seg de forutsetningene som skal til for å besvare oppfølgingsdelen av

undersøkelsen (3 måneder, 6 måneder og 12 måneder etter endt rusbehandling). Kontaktperson vurderes av pasienten selv og ut ifra hennes /hans egne behov.

Pasienten, behandleren og hjelpeapparatet burde helst ha definert kontaktpersonens posisjon mens pasienten fortsatt er i rusbehandlingen ved ReStart. Dette vil gjøre overgangen til hjemmesituasjonen mer forutsigbar.

Om pasienten ønsker det, kan hun/han velge å besvare spørreskjemaene i bolker. Pasienten bør føle seg i god form og stabil nok til å kunne besvare på spørsmålene. Det finnes ingen fasit eller riktige /gale svar. Når det gjelder intervjuet om ”Egne målsettinger” kan pasienten velge mellom behandler eller kontaktpersonen som intervjuer i oppfølgingsmålinger. Dersom det blir kontaktpersonen som intervjuer vil denne personen få innføring i hva intervjuet går ut på, få utdelt intervjuguide og skjema for registrering av målsettingene, m.m.

- Når det gjelder intervjuet er det ofte slik at vi må hjelpe pasienten til å sortere tankene og hente frem det som bør tas for seg her og nå. Spesielt i intervjuet ”egne målsettinger” bør vi hjelpe pasienten å sortere og ta utgangspunkt i det som er ”øverst på listen”.

- Tilrettelegg for besvarelse i samarbeid med pasienten. Man bør enes om tilrettelegging fra gang til gang. For eks, kan første oppfølgingsmåling foretas ifm en reinleggelse ved ReStart?, etc.

- Avtal tid og sted for utfylling av skjemaene, fysiske omgivelsene, etc.

- Det er tenkt å gi gevinst til pasienten (e.g. gavekort eller lignende) på slutten av deltakelse og ikke i begynnelsen. Pasientene skal ikke informeres om gevinst med mindre de spør. Dette er for å unngå at de motiveres til deltakelse av økonomiske grunner.

Følgende kommer det en oversikt over spørreskjemaene som benyttes i denne undersøkelsen:

Navn forkortelse	Hva måler det	Administrerings- måte	Tidspunkt det måles	Varighet	Antall Påstander
AUDIT	Screening problematisk alkoholbruk	Selvrapportering	Ila beh	5 min	10
DUDIT	Screening problematisk rusmiddelbruk	Selvrapportering	Ila beh	5 min	11
DUDIT-E	+ og – ved rusbruk og motivasjon for endring	Selvrapportering	Ila beh	7 min	44
KKS	Bakgrunnsdata	Intervju	Ila beh	1 t	3 deler, 44 spørsmål
ASRS	Screening ADHD symptomer	Selvrapportering/ intervju	Ila beh	10 min	18
ADHD-BAK	Bakgrunnsdata vedr. ADHD	Selvrapportering/ intervju	Ila beh	5 min	10
TCI	Personlighet	Selvrapportering	Ila beh	20 min	240
LOC	Opplevd kontroll	Selvrapportering	Ila beh	15 min	50
SOCRATES	Endringsprosess	Selvrapportering	Ila beh	10 min	19
GSE	Mestringstillitt	Selvrapportering	Ila beh	5 min	10
WHOQOL- BREF	Livskvalitet	Selvrapportering	Ila beh	15 min	28

BDI	Depresjon	Selvrapportering	Ila beh	3	6	12		15 min	21
STAI	Angst	Selvrapportering	Ila beh	3	6	12		15 min?	40
MINI-PLUSS	Psykisk helse  (Aske 1 lidelser)	Intervju	Ila beh			12		1 t	26 moduler
Intervju egne målsettinger	Mål og grad av måloppnåelse	Intervju	Ila beh	3	6	12		1 t	10 spørsmål

Takk for deres viktig bidrag i denne undersøkelsen og lykke til.



## Appendix 2 Depiction of Content Analysis

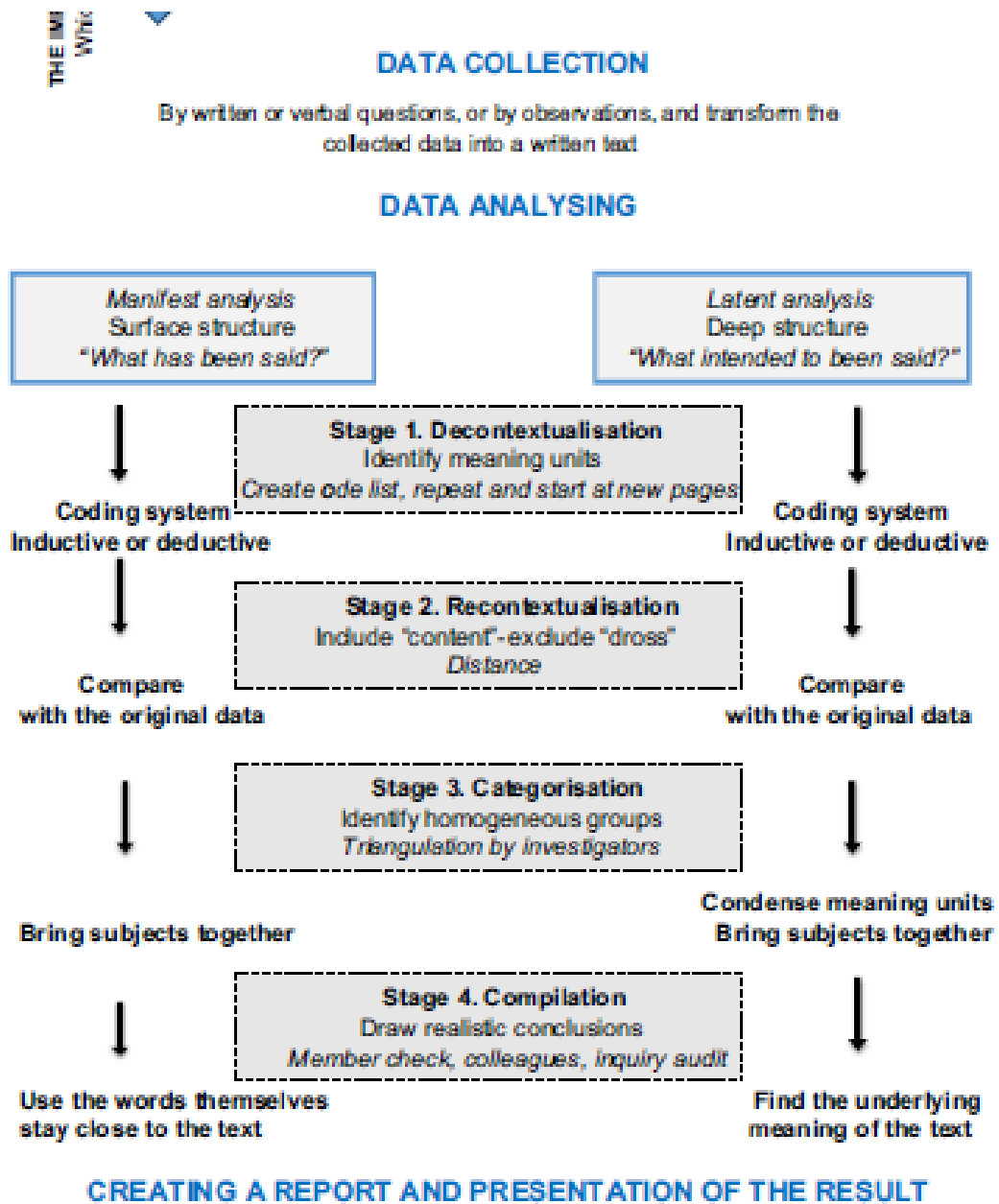


Fig. 1. An overview of the process of a qualitative content analysis from planning to presentation.


Figure used with the author's permission:

Bengtsson, M. (2016). How to plan and perform a qualitative study using content analysis

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

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## 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

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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 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 & Schmalzing, 1997; Blume, Schmalzing, & 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

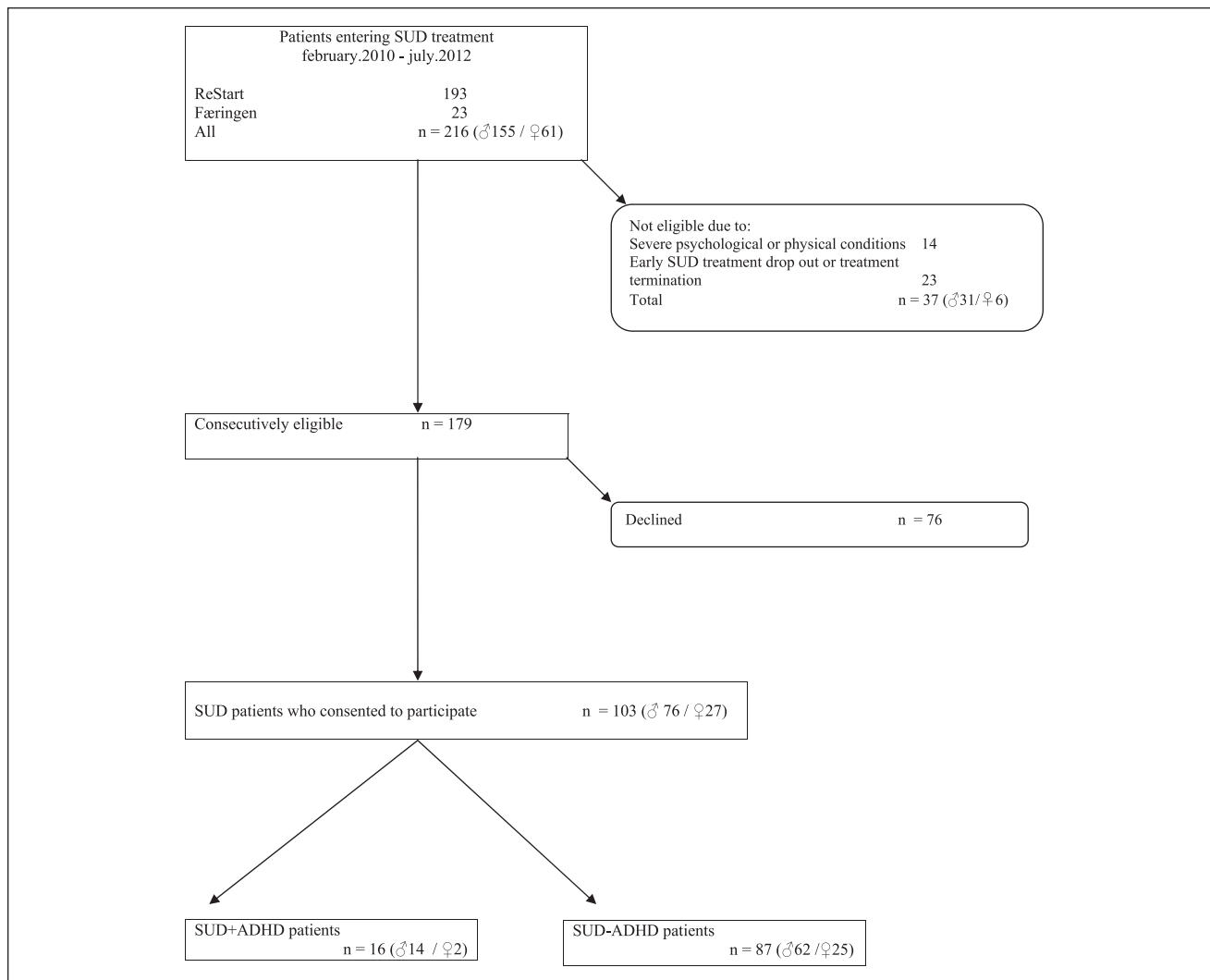
### Participants

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 10<sup>th</sup> Revision [ICD-10]; World Health Organization, 1992) from chart reviews. The ADHD assessment was well documented in the medical records and followed the national guidelines for the diagnosis of ADHD (Sosial-og Helsedirektoratet, 2007). 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.



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

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 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, Wohler, 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  $33.7 \pm 10.5$  years, range = 28-50. Mean observation time (e.g., since ADHD diagnosis was received and the current study) was  $3.7 \pm 3.5$  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

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

Patient characteristics	All SUD patients				SUD + ADHD group				SUD – ADHD group				SUD + ADHD vs. SUD – ADHD	
	<i>M</i>	<i>SD</i>	%	<i>n</i>	<i>M</i>	<i>SD</i>	%	<i>n</i>	<i>M</i>	<i>SD</i>	%	<i>n</i>	Statistic	<i>p</i>
Age	43.3	11.1		103	37.4	8.5		16	44.4	11.2		87	<i>t</i> = -2.38	.019 *
Onset age of substance use	15.1	5.0		96	13.6	2.7		15	15.4	5.2		81	<i>t</i> = -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 <sup>a</sup>			40.8	42			43.8	7			40.2	35		
Senior secondary education <sup>b</sup>			50.5	52			50.0	8			50.6	44		
Higher education			8.7	9			6.2	1			9.2	8		
Income <sup>c</sup> (missing = 1)													$\chi^2 = 2.27$	.519
Paid work			8.8	9			6.2	1			9.3	8		
Temporary social welfare <sup>d</sup>			52.0	53			68.8	11			48.8	42		
Permanent disability welfare <sup>e</sup>			32.4	33			18.8	3			34.9	30		
Under education			6.9	7			6.2	1			7	6		
Occupational status (missing = 3)														
Employed <sup>f</sup>			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 <sup>g</sup>													$\chi^2 = 0.64$	.725
Homeless/shelter/living with others			19.4	20			25.0	4			18.4	16		
Owned or rented residence <sup>g</sup>			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 <sup>h</sup> (missing = 1)			77.5	79			87.5	14			75.6	65	$\chi^2 = 0.52$	.500
Previous SUD treatment: Yes <sup>h</sup> (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 <sup>i</sup>			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 <sup>j</sup>														
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;  $\chi^2$  = Pearson's chi-square statistic.

<sup>a</sup>Ten years of compulsory education included three unfinished education.

<sup>b</sup>Including both academic oriented and vocationally oriented (3 and 4 years, respectively).

<sup>c</sup>Four weeks prior to SUD treatment.

<sup>d</sup>Including sick leave, unemployment, and rehabilitation.

<sup>e</sup>Including disability pension and retirement.

<sup>f</sup>Including part-time.

<sup>g</sup>Including municipal residence.

<sup>h</sup>Including polyclinical and/or institution.

<sup>i</sup>Receiving opioid replacement therapy: 31.4% (*n* = 13).

<sup>j</sup>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* ≤ .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 ( $N = 97$ ).

Variables	All SUD patients			SUD + ADHD group			SUD – ADHD group			SUD + ADHD vs. SUD – ADHD						
	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>	95% CI	<i>t</i>	<i>p</i>	Cohen's <i>d</i>	Adjusted <sup>d</sup> <i>p</i>		
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 <sup>b</sup>			27 <sup>b</sup>			123 <sup>b</sup>							
Recognition	29.5	6.1		26.4	6.0		30.2	5.9		[-6.2, -0.8]	2.57	.010	**	0.67 <sup>c</sup>	.022	*
Ambivalence	13.1	4.1		12.3	3.8		13.2	4.1		[-2.8, 1.4]	0.67	.506		0.27 <sup>c</sup>	.581	
Taking steps	34.9	5.5		36.3	3.7		34.6	5.8		[-1.1, 4.4]	1.15	.249		0.39 <sup>c</sup>	.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.

<sup>a</sup>Adjusted for age.

<sup>b</sup>Patients completed one questionnaire for each substance they considered as problematic. For this variable, *n* represents the number of completed questionnaires, rather than number of patients.

<sup>c</sup>Adjusted for generic group in a mixed model.

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

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).

### 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.



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

Patient characteristics	All SUD patients		SUD + ADHD group		SUD – ADHD group	
	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>
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 <sup>a</sup>	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 <sup>a</sup>	7.4	7	12.5	2	6.4	5
Other psychiatric problems <sup>b</sup>	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.

<sup>a</sup>Different relatives of those counted into the two previous categories.

<sup>b</sup>Most frequently reported mood and anxiety problems. Including first- and second-degree relatives.

### 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.

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Supplementary Table 1

Comparison of the degree of Substance use, ADHD symptoms, Personality and Readiness to Change in SUD+ADHD and SUD-ADHD patients (N= 97)

Variables	All SUD patients					SUD+ADHD group					SUD-ADHD group					SUD+ADHD vs SUD-ADHD					
	M	SD	N	Mdn	Range	M	SD	N	Mdn	Range	M	SD	N	Mdn	Range	D	95% CI	t	p	Cohen's d	Adjusted <sup>a</sup> p
AUDIT	21.4	11.7	97	25	40	14.0	11.7	16	8	33	22.9	11.2	81	26	40	-8.9	-15.0 - -2.8	2.89	.005 **	0.79	.017 *
DUDIT	15.6	17.1	97	9	44	24.1	16.3	16	28.5	42	13.9	16.8	81	0	44	10.1	1.0 - 19.2	2.21	.029 *	0.61	.363
ASRS			97																		
-Part A	12.5	5.9		13	24	17.4	4.6	16	19.5	15	11.5	5.7	81	12	24	5.9	2.9 - 8.9	3.90	.000 ***	1.07	.003 **
-Part B	24.2	10.0		24	45	32.1	7.3	16	33	28	22.6	9.8	81	23	45	9.5	4.3 - 14.6	3.67	.000 ***	1.00	.005 **
SOCRATES			150 <sup>b</sup>					27 <sup>b</sup>					123 <sup>b</sup>								
-Recognition	29.5	6.1		32	28	26.4	6.0		27	20	30.2	5.9		32	28	-3.5 <sup>c</sup>	-6.2 - -0.8	2.57	.010 **	0.67 <sup>c</sup>	.022 *
-Ambivalence	13.1	4.1		13	16	12.3	3.8		12	14	13.2	4.1		14	16	-0.7 <sup>c</sup>	-2.8 - 1.4	0.67	.506	0.27 <sup>c</sup>	.581
-Taking steps	34.9	5.5		37	32	36.3	3.7		38	11	34.6	5.8		36	32	1.6 <sup>c</sup>	-1.1 - 4.4	1.15	.249	0.39 <sup>c</sup>	.340
TCI-Temperament																					
-Novelty-seeking	19.9	5.2	92	19	23	23.1	4.7	15	24	16	19.3	5.1	77	19	23	3.7	0.9 - 6.5	2.63	.010 **	0.74	.108
--Exploratory excitability	4.7	2.3	92	5	10	5.7	2.3	15	5	8	4.5	2.2	77	5	10	1.2	-0.1 - 2.5	1.89	.063	0.53	.184
--Impulsiveness	4.9	2.1	92	4	8	6.0	1.9	15	6	6	4.7	2.1	77	4	8	1.3	0.2 - 2.5	2.25	.027 *	0.64	.159
--Extravagance	7.2	1.8	92	8	7	8.1	0.9	15	8	3	7.1	1.9	77	8	7	1.0	0.0 - 2.0	1.94	.056	0.55	.158
--Disorderliness	3.1	1.9	92	3	7	3.3	1.9	15	3	7	3.1	1.9	77	3	7	0.2	-0.9 - 1.3	0.40	.692	0.11	.637
-Harm avoidance	18.8	7.0	92	19	31	14.9	6.1	15	17	20	19.6	7.0	77	20	31	-4.6	-8.5 - -0.8	2.40	.019 *	0.68	.018 *
--Anticipatory worry	5.4	2.3	92	5	10	4.7	1.6	15	5	5	5.5	2.4	77	5	10	-0.9	-2.2 - 0.4	1.33	.186	0.38	.134
--Fear of uncertainty	4.4	1.8	92	4	7	2.8	1.5	15	3	5	4.7	1.7	77	5	6	-1.9	-2.8 - -1.0	4.07	.000 ***	1.15	.000 ***
--Shyness	4.4	2.3	92	5	7	4.0	2.6	15	4	7	4.5	2.3	77	5	7	-0.5	-1.8 - 0.8	0.79	.429	0.22	.290
--Fatigability	4.6	2.4	92	5	8	3.5	2.6	15	2	8	4.8	2.3	77	5	8	-1.3	-2.6 - 0.0	2.00	.049 *	0.56	.064
-Reward dependence	17.2	4.9	92	17	23	16.5	4.4	15	15	15	17.4	5.0	77	18	23	-0.9	-3.7 - 1.8	0.67	.504	0.19	.633
--Sentimentality	5.1	1.5	92	5	7	5.3	1.0	15	5	4	5.1	1.6	77	5	7	0.2	-0.6 - 1.1	0.55	.580	0.16	.600
--Openness to warm communication	5.9	2.6	92	6	9	5.9	2.3	15	6	8	5.9	2.7	77	6	9	0.0	-1.5 - 1.4	0.02	.984	0.01	.982
--Attachment	2.4	1.9	92	2	6	2.1	1.6	15	1	5	2.5	1.9	77	2	6	-0.4	-1.5 - 0.6	0.81	.417	0.23	.606
--Dependence	3.8	1.2	92	4	5	3.1	1.0	15	3	3	3.9	1.2	77	4	5	-0.7	-1.4 - -0.1	2.24	.028 *	0.63	.053
--Persistence	17.1	7.4	92	17	33	21.1	8.1	15	20	25	16.3	7.1	77	16	31	4.8	0.7 - 8.9	2.34	.021 *	0.66	.017 *
--Eagerness to effort	4.2	2.8	92	4	9	5.6	2.6	15	6	8	3.9	2.7	77	4	9	1.7	0.2 - 3.2	2.19	.031 *	0.62	.008 **
--Work hardened	4.8	2.1	92	5	8	5.1	2.2	15	5	6	4.8	2.1	77	5	8	0.3	-0.9 - 1.5	0.52	.601	0.15	.272
--Ambitious	4.1	2.2	92	4	10	5.6	2.4	15	5	7	3.8	2.1	77	3	10	1.8	0.5 - 3.0	2.89	.005 **	0.82	.025 *
--Perfectionist	3.9	2.0	92	4	8	4.8	1.9	15	5	6	3.7	2.0	77	4	8	1.1	0.0 - 2.2	1.92	.058	0.54	.098
TCI-Character																					
-Self-directedness	22.3	7.7	92	22.5	30	22.5	7.6	15	24	23	22.2	7.7	77	22	30	0.2	-4.1 - 4.6	0.11	.915	0.03	.641
--Responsibility	5.1	2.3	92	6	8	5.0	2.1	15	6	6	5.1	2.4	77	6	8	-0.1	-1.4 - 1.2	0.16	.876	0.04	.871
--Purposefulness	3.1	1.6	92	3	6	2.7	1.8	15	3	5	3.2	1.6	77	3	6	-0.4	-1.3 - 0.5	0.91	.365	0.26	.360
--Resourcefulness	2.4	1.5	92	2	5	2.9	1.4	15	3	5	2.3	1.6	77	2	5	0.6	-0.2 - 1.5	1.49	.139	0.42	.072
--Self-acceptance	6.6	2.4	92	7	9	6.5	2.3	15	7	8	6.7	2.4	77	7	9	-0.2	-1.6 - 1.1	0.31	.760	0.09	.761
--Congruent second nature	5.1	2.4	92	5	10	5.3	2.3	15	5	8	5.0	2.4	77	5	10	0.3	-1.0 - 1.7	0.47	.641	0.13	.413
-Cooperativeness	25.5	6.1	92	26	31	25.3	4.7	15	26	18	25.6	6.3	77	27	31	-0.2	-3.7 - 3.2	0.14	.891	0.04	.769

--Social acceptance	6.7	1.7	92	7	8	6.5	1.2	15	7	4	6.7	1.8	77	7	8	-0.1	-1.1	-	0.8	0.29	.772	0.08	.894
--Empathy	3.4	1.3	92	4	5	3.4	1.6	15	4	4	3.5	1.2	77	4	5	-0.1	-0.8	-	0.7	0.15	.879	0.04	.712
--Helpfulness	5.8	1.5	92	6	7	5.8	1.1	15	6	3	5.8	1.6	77	6	7	0.0	-0.9	-	0.9	0.01	.991	0.00	.889
--Compassion	4.9	2.5	92	6	7	4.9	2.7	15	6	7	4.9	2.5	77	6	7	0.0	-1.4	-	1.4	0.00	.998	0.00	.401
--Pure-hearted conscience	4.7	1.5	92	5	7	4.7	1.5	15	4	6	4.7	1.5	77	5	7	0.0	-0.9	-	0.8	0.08	.936	0.02	.862
--Self-transcendence	9.6	4.7	92	10	20	11.7	4.3	15	12	18	9.2	4.7	77	9	20	2.5	-0.1	-	5.1	1.92	.057	0.54	.077
--Self-forgetful	4.6	2.4	92	5	9	6.1	1.7	15	6	6	4.4	2.4	77	4	9	1.8	0.5	-	3.1	2.76	.007 **	0.78	.029 *
--Transpersonal identification	1.9	1.8	92	1	8	2.3	1.7	15	2	5	1.8	1.8	77	1	8	0.5	-0.5	-	1.5	0.92	.361	0.26	.241
--Spiritual acceptance	3.1	2.1	92	3	8	3.3	2.0	15	3	7	3.1	2.2	77	3	8	0.3	-0.9	-	1.5	0.45	.657	0.13	.570

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

*Note.*

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.

Abbreviations: SUD: Substance Use Disorders; ADHD: Attention Deficit Hyperactivity Disorder; M: mean; SD: standard deviation; Mdn: median; D: difference in means; 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.



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## CLINICAL PSYCHOLOGY & NEUROPSYCHOLOGY | RESEARCH ARTICLE

# Positive and negative aspects of substance use and treatment goals among substance use disorder patients with and without attention deficit hyperactivity disorder: A qualitative study

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**Abstract:** There is limited research on the perceptions of substance use (SU) and treatment goals among patients with substance use disorders (SUD) and attention deficit hyperactivity disorder (ADHD). We investigate whether SU perceptions and treatment goals were different among SUD patients with (SUD+ADHD) and without (SUD-ADHD) ADHD. Twelve SUD+ADHD patients (39.5 ± 8.5 years, 10 men), and 10 age- and substance severity matched SUD-ADHD patients (34.0 ± 10.0 years, six men), consecutively recruited between February 2010 and July 2012 were interviewed during the course of their SUD treatment. Interview data were analyzed using content analysis. The perceived positive aspects of SU were self-regulation of physical health, behavior, feelings, reasoning/thoughts, and the rewarding effects. The perceived negative aspects of SU included consequences on physical health, behavior, feelings, and reasoning/thoughts. SUD+ADHD patients less frequently

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### PUBLIC INTEREST STATEMENT

Substances use disorder (SUD) is a serious persistent condition in which uncontrolled and frequent substance use (SU) intake continues even when affecting the persons' health, relations and work. Attention deficit hyperactivity disorder (ADHD) starts in childhood, commonly continuing in adulthood. The core symptoms of ADHD are inattention, hyperactivity and impulsivity. We asked 12 adult SUD patients with (SUD+ADHD) and 10 without ADHD (SUD-ADHD) to describe the positive and negative sides of their SU and their SU-related treatment goals.

To most patients, SU changed negative thoughts, feelings, physical states and behavior into positive. Additionally, some enjoyed getting high/drunk. Paradoxically, SU also worsened negative thoughts, feelings, physical states and behavior.

SUD+ADHD patients most commonly mentioned that SU helped them control their behavior and less often linked SU to physical states at all. SUD+ADHD patients seldom considered quitting SU completely. SUD signifies a vicious circle, possibly more complex in persons with SUD+ADHD.



linked SU to physical health and more frequently perceived SU as helpful to self-regulate their behavior. Four treatment goals categories emerged: total abstinence, conditional abstinence, substance reduction, and unspecified. SUD+ADHD patients less frequently chose total abstinence, and when using more than one substance, they commonly chose variable goals. In contrast, SUD-ADHD patients chose more similar goals. SUD+ADHD patients showed a more complex relation to their SUD than SUD-ADHD patients.

**Subjects:** Mental Health; Psychological Disorders - Adult; Addiction - Alcohol - Adult; Addiction - Drugs - Adult; ADHD in Adults; ADHD

**Keywords:** substance use disorder; attention deficit hyperactivity disorder; qualitative; treatment goal; reduction; abstinence; SUD; ADHD; positive and negative perceptions; adult

Substance use disorders (SUD) are described by symptoms of tolerance, craving, uncontrolled and persistent substance use (SU), in spite of detrimental biopsychosocial consequences (American Psychiatric Association [APA], 2013; Saunders, Peacock, & Degenhardt, 2018). Individuals with SUD are frequently afflicted with attention deficit hyperactivity disorder (ADHD) (van de Glind et al., 2014), mood, anxiety, and personality disorders (Chen et al., 2011). ADHD is a neurodevelopmental disorder characterized by inattention, hyperactivity, and impulsivity (APA, 2013), that shares cognitive, motivational and reward difficulties with SUD (Kalbag & Levin, 2005; Wilens & Biederman, 2006). Studies have shown that about 14% of SUD patients fulfill the criteria for ADHD diagnoses (Roncero et al., 2015; van de Glind et al., 2014). In SUD clinical settings, patients with SUD and ADHD (SUD+ADHD) present at a younger age (Roncero et al., 2015), have an earlier SU debut, greater SU severity (Torok, Darke, & Kaye, 2012; Young et al., 2015), higher rates of psychiatric comorbidity (Kim et al., 2006; van Emmerik-van Oortmerssen et al., 2014; Wilens et al., 2005), and cognitive and social impairments (Brooks, Vosburg, Evans, & Levin, 2006) than SUD patients without ADHD (SUD-ADHD). Accordingly, SUD+ADHD patients may be more difficult to treat for SUD.

The complexity of SUD+ADHD calls for more research (Matthys et al., 2014), including qualitative studies on how SUD+ADHD patients relate to their own SUD. The available research suggests that adults with ADHD report more positive than negative effects of SU (Harty, Pedersen, Gnagy, Pelham, & Molina, 2015; Jensen et al., 2017; Mitchell et al., 2017), such as SU to cope with negative states, feel accepted and normal (Nehlin, Nyberg, & Oster, 2015), improve negative mood and ADHD symptomatology, and to get high (Canela, Buadze, Dube, Eich, & Liebreinz, 2017; Mitchell et al., 2017; Weisner et al., 2017; Wilens et al., 2007; Young et al., 2017). However, SUD+ADHD individuals have reported negative effects from SU, (e.g. increased impulsivity, aggression and social problems) (Kronenberg, Slager-Visscher, Goossens, van den Brink & van Achterberg, 2014; Nehlin et al., 2015). It is still unclear whether SUD+ADHD patients' SU perceptions differ from SUD-ADHD. This is crucial since intentional changes are only possible after a thorough evaluation in which the pros of changing a problematic behavior outweigh the cons (McEvoy & Nathan, 2007; Prochaska, DiClemente, & Norcross, 1992). This requires adequate cognitive functioning (Blume, Schmalzing, & Marlatt, 2005; Le Berre et al., 2012), which may be reduced among SUD+ADHD patients (Brooks et al., 2006).

SUD patients reporting severe SU, tend to choose treatment goals of total abstinence (Lozano et al., 2015; Lozano, Stephens, & Roffman, 2006) whereas those reporting less SU severity are less likely to choose total abstinence goals (DeMartini et al., 2014). There are no clear indications concerning which treatment goals SUD+ADHD patients prefer. In SUD treatment settings, treatment goals of total abstinence are associated with favorable outcomes (Adamson, Sellman, & Frampton, 2009; Berger, Brondino, Fisher, Gwyther, & Garbutt, 2016; Bujarski, O'Malley, Lunny, & Ray, 2013; Meyer, Wapp, Strik, & Moggi, 2014). However, substance reduction may be a viable treatment goal in

some cases (van Amsterdam & van den Brink, 2013). As ambivalence is common among SUD patients (Schlauch, Crane, Connors, Dearing, & Maisto, 2019), total abstinence may not be an option for some. Additionally, allowing total abstinence as the only outcome may keep some individuals from seeking SUD treatment (Wallhed Finn, Bakshi, & Andreasson, 2014). The acceptance of substance reduction is growing in SUD treatment centers (Klingemann & Rosenberg, 2009), whereas others may be still reluctant to accept treatment goals different from total abstinence (Davis & Rosenberg, 2013). As a positive therapeutic alliance is paramount in SUD treatment (Project Match Group, 1997), efforts should be made to understand SUD+ADHD patients' rationale behind their treatment goals choices, which may prevent treatment dropout. Evidently, more qualitative research on SUD+ADHD patients' perceptions of SU and their choice of treatment goal is needed.

The aims of this study were to qualitatively investigate whether (1) the positive and negative perceptions of SU and (2) SU-related treatment goals were different among SUD+ADHD patients and SUD-ADHD patients.

## 1. Materials and methods

### 1.1. Participants

Between February 2010 and July 2012, previously detoxicated SUD inpatients were consecutively recruited from two SUD treatment units at the University hospital in Northern Norway the ReStart unit, and in the last two months of the recruitment period, the Færingen unit. Written and verbal information about the study was provided; 16 SUD+ADHD patients and 87 SUD-ADHD patients agreed to participate and signed an informed consent form.

The ADHD assessment (International Classification of Diseases 10th Revision, World Health Organization [WHO], 1992) was conducted by clinical experts, independently from this naturalistic study. We obtained information on the diagnosis of ADHD from medical records. The information on ADHD was well documented as per the national guidelines (Directorate of Health and Social Affairs, 2007). The mean age at ADHD assessment was  $33.7 \pm 10.5$  years (range 18–50). Seven (58%) of the 16 SUD+ADHD patients were receiving psychostimulants (methylphenidate) during SUD treatment. More information about study participants and procedures is found in (Flores-Garcia et al., 2016).

This study comprises qualitative data from 12 of the 16 originally recruited SUD+ADHD patients, (four stopped treatment), and a subsample of 10 SUD-ADHD patients. Study participants were matched by age and SU severity, as young SUD patients seem to have high SU severity and a high dropout risk (Brorson, Ajo Arnevik, Rand-Hendriksen, & Duckert, 2013). The Regional Committee for Medical and Health Research Ethics granted approval for this study REK sør-øst B, 2009/1355b.

### 1.2. Measures and procedure

The ReStart unit and Færingen unit used the motivational interviewing (MI) (Rollnick & Miller, 1995) and Therapeutic community approaches (De Leon, 1999), respectively. Following treatment-as-usual (TAU) procedures, all study participants underwent M.I.N.I.PLUS (Sheehan et al., 1994) psychiatric interviews for the assessment of axis I disorders. Axis II disorders (Structured Clinical Interview for DSM-IV (SCID II) (First, Spitzer, Gibbon, Williams, & Benjamin, 1995) were only assessed when necessary. Substance use severity was assessed by the Alcohol Use Disorder Identification Test and the Drug Use Disorder Identification Test (Berman, Bergman, Palmstierna, & Schlyter, 2005; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). A semi-structured interview guide was developed by the leaders of the ReStart unit and the first author, which was adapted into a template form (see example in Appendix 1).

Participants were interviewed face-to-face and could attend as many interviews as they considered as necessary during their SUD treatment (range: 1–5 sessions). Most interviews took place at the beginning of treatment. They lasted about one hour each and were undertaken by

a clinician with whom patients closely collaborated (both genders) or by the first author, who did not have a clinician role at the time of the study. Clinicians followed TAU procedures when administering the paper and pencil interview, which included (1) the perceived positive and negative aspects of SU and (2) the SU-related treatment goals. Study participants' answers were documented in the template forms by the interviewers or, whenever preferred, by the participants themselves. Reading/writing assistance was provided. Since the treatment goals were meant to be evaluated at follow-up, patients were given a copy of the templates. Follow-up interviews were conducted three, six, and 12 months after discharge, including questions about non SU-related goals. This study exclusively reports the findings from interviews concerning SU-related goals during SUD treatment.

### **1.3. Data analysis**

The reasoning of this study was deductive (i.e. top-down), contrary to inductive reasoning, which involves no previous conceptual bases (i.e. bottom-up reasoning) (Bengtsson, 2016; Elo & Kyngas, 2008). In content analysis there are two data analysis techniques: manifest and latent (Bengtsson, 2016). In manifest content analysis, the aim is to explicitly describe the data, whereas latent content analysis aims to be more in-depth (Bengtsson, 2016). Interview data were analyzed using manifest content analysis, following four steps: decontextualization, recontextualization, categorization, and compilation (Bengtsson, 2016). For the decontextualization step, LFG and MK separately initiated the open-coding process (i.e. finding meaning units in the original texts), looking for patterns. Each author entered preliminary simple codes into a logbook and LFG reviewed these codes in relation to the original text, recoding when considered appropriate. The logbook was updated every time the codes were reviewed. This step was conducted several times, until agreement upon the final codes was reached. For the recontextualization step, LFG and MK reviewed the final codes, excluding unrelated study topics and including relevant unclassified text. In the categorization step, provisional categories were created by organizing codes with similar patterns. The category descriptions were constructed from the data (Bengtsson, 2016; Elo & Kyngas, 2008) by LFG, MK and TNB. Inter-rater reliability was conducted (Hallgren, 2012). In order to improve validity in the compilation step, codes and categories were first revisited by LFG and MK in relation to the original text, and then a second time by TNB. Frequency endorsements of codes and categories for SU aspects and treatment goals were summarized. The perceived positive and negative aspects of SU were categorized as intrapersonal and interpersonal. We mainly focused on the intrapersonal aspects, briefly mentioning the interpersonal since saturation was not reached in the latter. Treatment goals were classified by how concretely they were stated. Participants did not provide feedback on the findings. Examples of the coding process are shown in Table 1.

## **2. Results**

Two of the patients in the study sample were from the Færingen unit. All patients but one (SUD +ADHD) were voluntarily receiving SUD treatment. Mann-Whitney *U* tests (Table 2) confirmed that no significant differences were observed in age or degree of SU severity between the SUD+ADHD and SUD-ADHD patients. The majority had previously completed SUD treatment and consumption of more than one substance was common in both SUD groups. Kappa coefficients across all the categories were  $.65 >$  (from substantial to perfect), with an average of  $.85$ .

### **2.1. Perceived positive aspects of substance use**

Positive intrapersonal aspects of SU included: self-regulation of *physical health, behavior, feelings, reasoning/thoughts*, and the *rewarding effects* of SU (Table 3). Positive interpersonal aspects comprised SU for social gathering, or drinking with meals. Compared to SUD-ADHD patients, SUD +ADHD patients rarely perceived SU as having positive effects on self-regulation of physical health, and more often perceived SU as having positive effects on self-regulation of behavior. Both SUD groups perceived SU as positive for the self-regulation of feelings, reasoning/thoughts, as well as for the rewarding effects, with a similar frequency.

**Table 1. Examples of the coding process. Interviews on the Positive and Negative Aspects of Substance Use and Treatment Goals**

Research question	Substance	Meaning unit	Code	Sub-category	Category
Positive aspects of SU	Alcohol	I sleep very well	It gives good sleep quality	Physical health	Self-regulation
	Amphetamine	It keeps me from doing harmful/impulsive things	It helps stopping unwanted behavior	Behavior	Self-regulation
	Benzodiazepines	I feel pleasure when used in combination with heroin	It gives pleasure	-	The rewarding effects
Negative aspects of SU	Alcohol	I might experience depression. It may be strengthened by alcohol	It gives/strengthens negative mood	Feelings	Consequences
	Cannabis	It results in a deteriorated memory and concentration	It worsens memory and concentration	Reasoning/ thoughts	Consequences
SU-related treatment goals	Amphetamine	I want to quit amphetamine use completely	Total abstinence		Total abstinence
	Amphetamine	Stop using if I get assessment and medication for ADHD	Abstaining from SU if receiving assessment and medication for ADHD		Conditional Abstinence
	Alcohol	Drink for example once a month without getting drunk	Reduce in frequency and amount of SU		Substance reduction
	Cannabis	Avoid using cannabis	No clear SU-related goal		Unspecified

Note. SU: Substance use

**Table 2. Sociodemographic and clinical characteristics**

	SUD+ADHD	%	SUD-ADHD	%	Statistic	P
	N = 12		N = 10			
Age M (SD)	39 (8.5)		33.5 (10.0)		U = 1.42	.156
Mdn (range)	40.5 (21)		35.0 (28)			
Age of Substance use initiation M (SD)	13.3 (3.0)		13.4 (1.3)		U = 0.07	.939
Mdn (range)	14.0 (11)		13.0 (4)			
AUDIT M (SD)	15.5 (12.7)		21.6 (15.0)		U = 1.18	.234
Mdn (range)	11.5 (33)		22.5 (40)			
DUDIT M (SD)	20.3 (16.8)		28.1 (16.8)		U = 1.16	.246
Mdn (range)	23.5 (41)		36 (43)			
Males		83		60	$\chi^2 = 1.50$	.348
Not living with partner		75		80	$\chi^2 = 2.31$	.315
Previous SUD treatment:		75		80	$\chi^2 = 3.58$	.310
-Inpatient		75		60		
-Outpatient		-		20		
-None		-		20		
Previous treatment for mental health problems <sup>a</sup>		70		83	$\chi^2 = 0.55$	.624
Other mental disorders—current:		25		30		
-Schizophrenia		8		-		
-Affective disorders		8		-		
-Anxiety disorders		8		10		
-Eating disorders		-		10		
-Personality disorders		-		10		
Previous SUD treatment						

(Continued)

**Table 2. (Continued)**

	SUD+ADHD	%	SUD-ADHD	%	Statistic	P
SUD diagnoses:						
-Alcohol		50		50		
-Opioids		17		20		
-Cannabis		17		50		
-Benzodiazepines		17		20		
-Amphetamines		50		70		
Number of self-reported substances of abuse:					$\chi^2 = 1.21$	.271
-One substance		41.7		20		
-Two or more substances		58.3		80		
Frequency of self-reported substances of abuse:					$\chi^2 = 1.15$	.886
-Alcohol		66.6		60		
-Amphetamines		50.0		70		
-Cannabis		33.3		50		
-Benzodiazepines		25.0		20		
-Opioids		16.6		10		

\*p ≤ 0.05, two-tailed.

Sociodemographic and clinical characteristics of SUD patients with (N = 12) and without ADHD (N = 10)

Note. N can vary slightly. SUD: Substance Use Disorder; ADHD: Attention Deficit Hyperactivity Disorder

SD: Standard deviation; AUDIT: Alcohol Use Disorder Identification Test; DUDIT: Drug Use Disorder Identification Test. U: Mann-Whitney U test;  $\chi^2$ : chi-squared test.

‡ Unspecified if inpatient or outpatient.

**Table 3. Description and frequency endorsement of the self-reported Positive and Negative Aspects of Substance Use in SUD patients with (N = 12) and without ADHD (N = 10)**

Positive Aspects of Substance Use	SUD+ADHD	SUD-ADHD
	N = 12	N = 10
	%	%
<b>Self-regulation:</b>		
<i>Physical health.</i> Substance use is perceived to improve the physical discomfort at a basic physical level. Sometimes the substances are perceived to alleviate the discomfort caused by other substances.	8	60
<i>Behavior.</i> Substance use is perceived to help redirecting unwanted behavior, as well as completing, performing or coping with demanding activities and situations, and increasing productivity.	58	20
<i>Feelings.</i> Substance use is perceived to mitigate negative feelings of anxiety, lack of motivation, increasing feelings of well-being.	83	100
<i>Reasoning/thoughts.</i> Substance use is perceived to improve positive thinking. Additionally, improving cognitive abilities and limiting excessive thinking.	66	50
<b>The rewarding effects:</b>	25	40
Substance use in order to enjoy the euphoric effects: Such an experience does not involve a self-regulatory function, but rather involves hedonistic purposes.		
<b>Negative Aspects of Substance Use</b>		
<b>Consequences:</b>		
<i>Physical health.</i> Substance use is perceived to result in a deteriorated physical health, including problems with blood pressure, sleep, decreased appetite and increased physical pain.	42	100
<i>Behavior.</i> Substance use is perceived to give rise to unwanted behavior such as aggression, passivity, or lack of control of substance consumption. These negative actions conflict with the individual's true intentions.	50	60
<i>Feelings.</i> Substance use is perceived to give rise to or strengthen negative feelings, such as anxiety, depressed mood, irritation or even numbness.	50	80
<i>Reasoning/thoughts.</i> Substance use is perceived to have consequences such as mental exhaustion, remorse, disorientation and bad memory.	83	90

Note. SUD: Substance Use Disorder; ADHD: Attention Deficit Hyperactivity Disorder.

### 2.1.1. Self-regulation of physical health

Self-regulation of physical health was predominantly mentioned by SUD-ADHD patients. SU was considered to alleviate physical pain, improve sleep quality and appetite. For instance:

*“I sleep very well”* (SUD-ADHD P10, alcohol).

Substances were additionally perceived to counteract withdrawals caused by other substances:

*“It (cannabis) lessens the suboxone withdrawal”* (SUD-ADHD P6).

### 2.1.2. Self-regulation of behavior

Patients used substances to help them redirect unwanted behavior, and to complete or cope with activities perceived as demanding. These SU perceptions were described to a greater degree by SUD+ADHD patients across different substances. SUD+ADHD P1 said:

*"I start using without thinking about it. Amphetamine allows me to control my impulsivity. I function normally, getting things done"*.

In this example SU was initiated by impulsive behavior and paradoxically, SU was perceived to manage the impulsivity. SUD+ADHD P6 said:

*"It (amphetamine) keeps me from doing harmful/impulsive things"*.

Similar to the previous example, P6 perceived that SU helped stop unwanted behavior. SUD+ADHD P4 expressed that SU assisted in everyday life functioning and in relating to others:

*"I am able to socialize"* (alcohol)

*"It helps me in my everyday life"* (benzodiazepines).

SUD+ADHD P10 asserted that alcohol helped to pause an activity at hand allowing him to switch to a more enjoyable task.

*"To postpone important tasks. I have a tendency to do a lot of one specific thing. I want to allow myself to do meaningless things"* SUD+ADHD P10.

Some of the SUD-ADHD patients linked SU to improved productivity:

*"I become hard-working"* (P5, amphetamine).

### 2.1.3. Self-regulation of feelings

The positive effects of SU to self-regulate feelings was expressed as the substances helping to improve negative feelings or cope with overwhelming feelings. For instance:

*"It helps relieve the anxiety so I can tolerate being on my own company. It is better to use medication that is addictive than to have no quality of life at all"* (SUD+ADHD P8, benzodiazepines).

P8 accepted having a benzodiazepine addiction, experiencing that its use reduced negative feelings in order to tolerate his own company. Other examples of perceived positive mood changes due to SU were *"to calm down"*, *"to stop boredom"* and *"feeling good about oneself."* For instance:

*"I feel happy"* (SUD-ADHD P7, alcohol).

### 2.1.4. Self-regulation of reasoning/thoughts

The perceived positive effects of SU in reasoning/thoughts involved improve positive thinking, cognitive endurance, concentration, and limiting negative thoughts (e.g. *"flashbacks disappear"* and *"increased self-knowledge/self-confidence"*). Other examples include:

*"At first, you become collected"* (alcohol), and *"I become creative, sharp"* (amphetamine) (SUD+ADHD P12).

*"I become more focused"* (SUD-ADHD P2, amphetamine).



P12 experienced being collected and creative when using alcohol and amphetamines; P2 reported similar effects by amphetamines.

#### 2.1.5. *The rewarding effects*

The rewarding effects of SU were meant to enhance pleasant effects, and did not have self-regulating purposes. Some examples provided were “*becoming comfortably numb when talking too much*,” the enjoyment of “*getting high*,” “*euphoria*,” “*laughter*,” and “*stronger sensory impressions*”. The rewarding effects of SU were expressed across different substances:

*“I have experienced many good trips”* (SUD+ADHD P5, amphetamine).

Some patients noted that combining substances intensified the rewarding effects:

*“I feel pleasure when used in combination with heroin”* (SUD-ADHD P8, benzodiazepines).

## 2.2. *Negative aspects of substance use*

The perceived negative aspects of SU followed themes similar to the positive aspects including the consequences of SU on *physical health, behavior, feelings, and reasoning/thoughts* (Table 3). The negative interpersonal consequences comprised ruptures in close relationships, economic problems, loss of drivers’ licenses, and legal problems.

### 2.2.1. *Consequences on physical health*

As with the perceived positive aspects, SUD+ADHD patients uncommonly related SU to physical health consequences compared to SUD-ADHD patients. This category included problems with blood pressure, oral health, sleep issues, decreased appetite and digestive problems, hepatitis, weight gain, breathing difficulties and increased physical pain:

*“I become weak, in pain, have a bad appetite. I become tired and hungry”* (SUD-ADHD P5, amphetamine).

P5 mentioned the diverse physical consequences of amphetamine use. SUD+ADHD P8 expressed:

*“It (heroin) destroys the veins”*.

### 2.2.2. *Consequences on behavior*

SU negatively impacted behavior, resulting in passivity, aggression, and a reduced control over such as “*becoming inactive, passive and postponing tasks*,” “*saying or doing things I did not intend to*,” “*losing spontaneity*,” and “*having to use a lot of it*”. The negative actions were unintended:

*“I become aggressive if I drink spirits or too much”* (SUD+ADHD P11, alcohol).

*“The addictive behavior. I am out of control, with aggressive behavior”* (SUD-ADHD P4, alcohol).

### 2.2.3. *Consequences on feelings*

The negative consequences of SU on feelings varied in intensity, from expressing

depressed mood to emotional numbness. For instance:

*“I might experience depression. It might be strengthened by alcohol”* (SUD+ADHD P9, alcohol).

*“I become emotionally blunted”* (SUD-ADHD P1, benzodiazepines).

Other commonly mentioned consequences of feelings were expressed as “*the worsening of anxiety*,” “*feeling unease*,” “*being unmotivated*,” and “*becoming irritable or angry*.”

#### 2.2.4. Consequences on reasoning/thoughts

For some patients, SU resulted in weakened reasoning/thoughts (e.g. “losing sense of time and place,” and having “deteriorated memory and concentration.” Further, participants described mental exhaustion and decision-making that was contrary to their own moral standards:

“I become mentally tired” (SUD+ADHD P7, amphetamine).

“My ability to make the right decisions decreases. I have low scruples” (SUD-ADHD P4, amphetamine).

Other consequences on reasoning/thoughts included “having psychotic thoughts,” and “remorse.”

In sum, SUD+ADHD patients less frequently linked SU to physical health (either positively or negatively) compared to SUD-ADHD patients. Furthermore, SUD+ADHD patients more frequently linked SU to positive changes in behavior than SUD-ADHD patients. Otherwise, the SUD groups had similar perceptions across the different substances.

### 2.3. Substance use-related treatment goals

Four treatment goals categories were identified. *Total abstinence*, which referred to clear statements of wanting to completely abstain from SU. When multiple substances were involved total abstinence was sometimes limited to one specific substance. *Conditional abstinence* consisted of quitting SU or refraining from illegal use, on the condition of initiating, changing, or increasing the dosage in the prescription medication. *Substance reduction* consisted of reduced SU in frequency and amount compared to the consumption before entering SUD treatment. *Unspecified* consisted of vague statements of avoiding SU or indirectly related to SU.

#### 2.3.1. Treatment goals of total abstinence

This category comprised clear statements of wanting to abstain completely from SU, such as “I won’t use the substance anymore,” “stay clean for good,” or “quit using”. For instance, SUD-ADHD P10 said:

“I want alcohol to be completely absent. I am sober today. I want to keep being sober”.

P10 clearly preferred to continue abstaining from alcohol use. Treatment goals of total abstinence were less common among SUD+ADHD patients compared to SUD-ADHD patients. Figure 1 depicts the frequency in which total abstinence goals were chosen. SU was limited to alcohol, amphetamines, and cannabis as these were the most frequently used substances by both SUD groups.

Figure 1 indicates that compared to SUD-ADHD patients, SUD+ADHD patients less frequently preferred total abstinence concerning alcohol and amphetamines.

#### 2.3.2. Treatment goals of conditional total abstinence

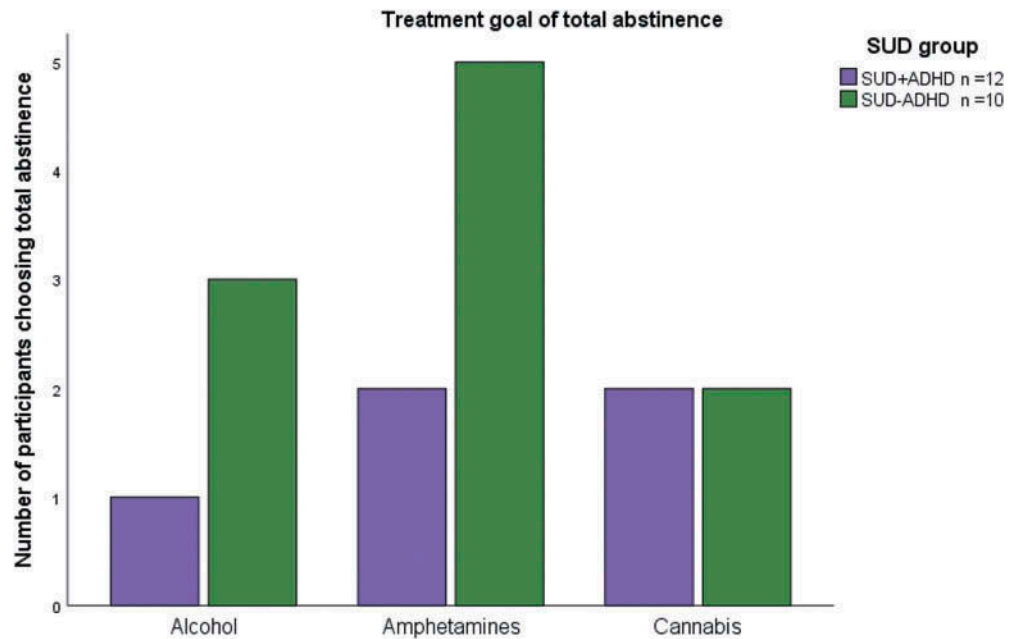
Conditional total abstinence (i.e. abstaining totally from SU or stop illegal use if changes in pharmacological treatment status were made). This category was represented by SUD+ADHD patients, P6 expressed the following:

“Stay away from illegal use of amphetamines for medicinal use. Don’t take amphetamine unless I start with dextroamphetamine.”

P6, was receiving methylphenidate and would compromise to stop illegally buying amphetamines if the current prescription was changed to dextroamphetamine (a more potent stimulant) (Kolar et al., 2008). Although the example above refers to amphetamines, other substances were described similarly:

**Figure 1. Frequency of total abstinence goals concerning amphetamines, alcohol and cannabis.**

Abbreviations: SUD: Substance Use Disorders; ADHD: Attention Deficit Hyperactivity Disorder.



*“To eliminate illegal use of benzodiazepines. In the past, when I received the right benzodiazepine dose, I stopped using illegally” (SUD+ADHD P8).*

P8 was able to stay away from illegal benzodiazepine use in the past when receiving an adequate dose. P8 would eliminate illegal use if the medication dosage was increased.

### 2.3.3. Treatment goals of substance reduction

Substance reduction goals were somewhat common among SUD+ADHD patients. Examples of treatment goals of reduced SU are provided below:

*“Try to reduce. Drink for example once a month without getting drunk” (SUD+ADHD P1).*

*“Abstain from alcohol while I am under SUD treatment. Drink a couple of beers once a month. So that alcohol does not affect my everyday life” (SUD+ADHD P12).*

Substance reduction was also mentioned by a few SUD-ADHD patients:

*“Take a break from cannabis. Get in control, don’t feel powerless. I want to use 1–2 grams about 1–2 times a week” (SUD-ADHD P2).*

P2 wanted to limit the amount and episodes of cannabis use.

### 2.3.4. Unspecified treatment goals

Unspecified treatment goals were frequent in both SUD groups. Statements such as “wishing not to use,” “trying to avoid using,” or those not directly related to SU were categorized as unspecified:

*“Dare to open up about my alcohol problem” (SUD+ADHD P3).*

P3 did not express a concrete goal concerning alcohol use.

Whenever more than one substance was involved, SUD+ADHD patients commonly chose different goals across the different substances, while the SUD-ADHD patients frequently had the same goals. For instance, when asked about the treatment goals for each substance, SUD+ADHD P4 decided on total abstinence from amphetamine and reduction in alcohol use:

*“No more amphetamine.”*

*“Abstaining completely from drinking (alcohol) until the next follow-up, but eventually drink normally.”*

Similarly, SUD+ADHD P11 wanted to completely abstain from benzodiazepine use, was unclear about cannabis, and expressed ambivalence toward alcohol:

*“I won’t use benzodiazepines anymore.”*

*“avoid using cannabis.”*

*“I want to find out which goal I want to have in relation to alcohol. It is not a problem in itself, but I am starting to wonder whether I should stop drinking. Can it lead to other substance use? Can I become addicted to alcohol instead of other substances?”*

In contrast, the SUD-ADHD patients tended to report the same goals across the different substances of use. For example, concerning total abstinence, P9 reported:

*“To continue abstaining totally”* (SUD-ADHD P9, amphetamine and cannabis).

In the following case, SUD-ADHD P1 expressed similar goal patterns concerning alcohol and benzodiazepines. Both cases were categorized as unspecified:

*“I want to take one day at a time”* (alcohol).

*“Accept that the doctor refuses to prescribe me benzodiazepines.”*

In sum, SUD+ADHD patients chose treatment goals of total abstinence less frequently than the SUD-ADHD patients. Additionally, those SUD+ADHD patients using more than one substance commonly set different treatment goals across the different substances, while SUD-ADHD patients usually had similar goals across the different substances. Unspecified treatment goals were observed in both SUD groups.

### 3. Discussion

We explored whether SUD+ADHD and SUD-ADHD patients had different positive and negative perceptions of SU and preferred different treatment goals. We found that SUD+ADHD patients rarely perceived neither positive nor negative aspects of SU related to physical health, and more frequently perceived positive effects of SU on self-regulation of behavior. Otherwise, the SUD groups expressed similar perceptions. With regard to the SU-related treatment goals, SUD+ADHD patients set total abstinence less frequently. Additionally, the treatment goals among SUD+ADHD patients using more than one substance were variable across the different substances, whereas among SUD-ADHD patients consuming more than one substance, treatment goals were similar across the different substances. It was unclear why SUD+ADHD patients seldom linked SU to physical health. Since both SUD groups showed similar SU profiles and high SU severity, it was plausible to expect that both groups also perceived similar effects of SU on physical health. This finding contradicts previous studies showing that individuals with SUD+ADHD consider that SU negatively impacts their physical health (Jensen et al., 2017; Kronenberg et al., 2014). One possible explanation is that SUD-ADHD patients were in worse somatic health than SUD-ADHD patients. Alternatively, the cognitive issues associated

with ADHD (Brooks et al., 2006; Marx, Krause, Berger, & Hassler, 2014), possibly interfered with SUD +ADHD patients' evaluations of the pros and cons of SU on their physical health.

The findings that SUD+ADHD patients perceived that SU was positive for self-regulating unwanted behavior (e.g. impulsivity) supports previous studies (Kronenberg et al., 2014; Nehlin et al., 2015). Potentially, the behavioral impulsivity inherent in ADHD (Crunelle, Veltman, van Emmerik-van Oortmerssen, Booij, & van den Brink, 2013) may explain the positive link between SU and self-regulation of behavior made by these participants. However, this is a hypothesis that needs to be further investigated.

The findings that the SUD groups perceived SU as positive for the self-regulation of feelings, reasoning/thoughts and the rewarding effects are in line with previous studies on individuals with problematic SU with and without ADHD (Mitchell et al., 2017; Wilens et al., 2007). Interestingly, both SUD groups expressed seeking SU for their rewarding effects (enjoying the high/being drunk). Novelty seeking (e.g. impulsive seeking of highly rewarding events) (Cloninger, Przybeck, Svrakic, & Wetzel, 1994) has been associated with SUD (Palmer et al., 2013) and ADHD (Perroud et al., 2016). The most recognized hypotheses on the link between SUD and ADHD are self-medication (SU to relieve negative states) (Khantzian, 1985) and a biological predisposition to seek immediate rewards (Ortal et al., 2015; Sousa et al., 2011; S. Young & Sedgwick, 2015). The present results are in line with both hypotheses.

A trend in which SUD+ADHD patients rarely preferred treatment goals of total abstinence was observed. To our knowledge, there is no research on this topic among SUD+ADHD patients. However, some SUD field studies have suggested that individuals consider changing their problematic SU when they experience greater cons than pros from SU in their lives (DeMartini et al., 2014; Prochaska et al., 1992). The findings on the SU-perceptions suggest that SUD+ADHD patients experienced more pros than cons from SU. This may explain why they less commonly preferred total abstinence goals. The finding that SUD+ADHD patients had variable treatment goals whenever multiple substances were involved may be related to problem-solving difficulties associated with ADHD (Young, 2005).

Notably, unspecified SU-related goals were frequent in both groups. These may be expressions of ambivalence, common among individuals with SUD (Magill, Stout, & Apodaca, 2013; Schlauch et al., 2019). However, we cannot rule out that treatment goals categorized as unspecified were merely a result of methodological issues (e.g. how the questions were asked and interpreted by the interviewers and participants, coding process, etc). Additionally, as motivation toward total abstinence may be strongest early in treatment, eventually decreasing (Wallhed Finn et al., 2014), the timing in which the interviews were conducted might have been crucial in participants' treatment goals preferences.

Overall, our findings of how substances positively and negatively affected patients' feelings, reasoning/thoughts, physical health, behavior, and social relations support the current biopsychosocial understanding of SUD (APA, 2013; Saunders et al., 2018). Furthermore, this apparent contradiction in which SU may represent a sustained way to cope with negative states and, paradoxically exacerbate them, may reflect the negative cycle inherent in SUD, as previously reported (Kronenberg et al., 2014; Pettersen, Ruud, Ravndal, & Landheim, 2013). The present results indicate that SUD+ADHD patients' relation to their SU is highly complex.

### **3.1. Clinical implications**

SUD+ADHD patients may require more guidance than SUD-ADHD patients in assessing the positive and negative effects of SU and in setting treatment goals compatible with their degree of SU and life goals. We recommend the following interventions: A) SUD+ADHD patients should be systematically asked about their SU perceptions, including physical health previous to setting treatment goals. B) SU severity should be systematically assessed. This may enable a better understanding of SUD+ADHD patients' rationale behind their SU, and compensate for potential problem-solving difficulties. The updated definition of SUD (APA, 2013; Saunders et al., 2018), may be a useful

guideline to appropriately assess SU severity. C) To avoid attrition, alternative goals to total abstinence should be considered. D) A meaningful therapeutic alliance may facilitate a common understanding of patients' SU perceptions and goals.

### 3.2. Limitations

The number of participants in this study was relatively small. Additionally, to reduce patient burden, in-depth interviews were not conducted. Consequently, crucial themes concerning everyday functioning, emotional liability, and psychostimulant treatment remained unexplored. Furthermore, although the vast majority of study participants were recruited from the ReStart unit, participants from the Færingen unit might have provided answers according to this unit's TAU practice. Moreover, our findings may be attributed to methodological procedures, not ADHD status. No information was obtained from four SUD+ADHD patients (treatment drop-outs) who may have had greater SU severity. The present findings should be considered as preliminary, as further research on this topic is needed.

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**Appendix 1. Example of interview guide**

**1. SUBSTANCE USE INFORMATION**

Please describe the substances you have used most frequently in the past 12 months			
Substance of use	Is your substance use considered to be problematic (by yourself?/others?)	What are the positive aspects?	What are the negative aspects?
1.			
2.			
3.			

**2. TREATMENT GOALS RELATED TO SUBSTANCE USE**

Please determine the treatment goal(s) specified by type of substance that you consider as problematic.		Next evaluation date:		
Substance of use	What are your treatment goals?	Strategies		
		Concrete plan of action	Your strengths?	Challenges/obstacles for change?
1.	1.	WHAT CAN YOU DO?: 1.		
		WHAT DO YOU NEED FROM THOSE AROUND YOU?: 1.		

**3. TREATMENT GOALS RELATED TO OTHER LIFE DOMAINS. SELECTION OF IMPORTANT DOMAINS**

Keyword list:

Select domains that you want to prioritize, and rate them on the next page. Remember! Choosing the number of domains should be realistic to work with, considering the next evaluation date and your own opportunities.

\_\_\_ Self-growth: well-being, self-worth (specify)

\_\_\_ Health: Physical health, mental health (specify)

\_\_\_ Economy

\_\_\_ Network: Public support system/social/friends/family (specify)

\_\_\_ Carrer/Job

\_\_ Substance abuse, coping strategies

\_\_ Inattention

\_\_ Impulsivity

\_\_ Hyperactivity

\_\_ Other? What?

**4. TREATMENT GOALS RELATED TO OTHER LIFE DOMAINS.**

			Next evaluation date:	
Domain	Description of your current situation and treatment goal (wanted situation)	Action plan	Your strengths?	Challenges/obstacles for change?
1.	What is your current situation?:	What can you do?: 1.		
	What is your treatment goal?	What do you need from those around you?: 1.		

**Appendix 2 Frequency endorsement of Substance Use related Treatment Goals in SUD patients with (N = 12) and without ADHD (N = 10)**

Treatment goal category	SUD+ADHD			SUD-ADHD	
	Substances ♦ n = 23	%		Substances ♦ n = 21	%
Total abstinence <sup>a</sup>	6	26.1		10	47.6
Conditional abstinence <sup>b</sup>	4	17.4		1	4.8
Reduced use <sup>c</sup>	5	21.7		2	9.5
Unspecified <sup>d</sup>	8	34.7		8	38.1

Note. SUD: Substance Use Disorder; ADHD: Attention Deficit Hyperactivity Disorder.

♦ Across all substances reported by participants.

<sup>a</sup> Clear statements of wanting to abstain completely from substance use. Total abstinence was sometimes limited to one specific substance, when multiple substances were involved.

<sup>b</sup> Quit substance use or refrain from illegal use, on the condition of starting up, changing or increasing psychopharmacological treatment dosage, such as central stimulant medication or other prescribed habit-forming medication.

<sup>c</sup> Usage reduced in frequency and amount, compared to the consumption before entering SUD treatment.

<sup>d</sup> Vague statements of avoiding substance use or indirectly related to substance use.



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# Quality of life in substance use disorder patients with and without attention deficit hyperactivity disorder 12 months after treatment: a naturalistic follow-up study

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## Abstract

There is sparse research on quality of life (QoL) as an outcome measure in patients with substance use disorders (SUD), with or without attention deficit hyperactivity disorder (ADHD). We aimed to investigate whether SUD patients with and without ADHD (SUD + ADHD vs. SUD – ADHD) differed in QoL at baseline and at a 12-month follow-up after SUD treatment. The groups were additionally compared with data from a national population sample (NPS). From a sample of 16 SUD + ADHD and 87 SUD – ADHD patients originally recruited between 2010 and 2012, eight SUD + ADHD (50.0%) and 28 SUD – ADHD (32.2%) patients were reached at follow-up. QoL was measured with the short version of the World Health Organization QoL instrument (WHOQOL-BREF). Cross-sectional data on QoL from NPS was utilized. Compared to NPS, SUD patients reported significantly lower QoL at baseline and follow-up. Furthermore, QoL was similar at baseline in SUD + ADHD and SUD – ADHD patients. At a 12-month follow-up after SUD treatment, SUD + ADHD patients' QoL had improved, however, not significantly differing from SUD – ADHD patients or the NPS. SUD – ADHD patients' QoL remained significantly lower. At follow-up, SUD + ADHD patients' QoL improved nominally compared to SUD – ADHD patients, but not the NPS. The clinical and functional relevance of these findings should be investigated further.

**Keywords** Substance use disorders · Attention deficit hyperactivity disorder · Adult · General population · Prospective · Quality of life

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Substance use disorders are defined by cravings, tolerance, withdrawal symptoms and a compulsive substance seeking despite the devastating consequences at physical, psychological, interpersonal and societal levels (American Psychiatric Association 2013; Volkow and Baler 2014). Adults seek substance use disorder (SUD) treatment frequently present with attention deficit hyperactivity disorder (ADHD) as a co-occurring condition (5–31%) (van de Glind et al. 2014). ADHD is a neurodevelopmental disorder encompassing the core symptoms of inattention, hyperactivity and impulsivity (American Psychiatric Association 2013). Both disorders have similar difficulties, including impulsive decision-making and reward deficits (Ortal et al. 2015). In addition, individuals with SUD may present symptoms resembling those of ADHD, including states of intoxication or withdrawal (Levin 2007). Other mental conditions in SUD (e.g., bipolar disorder, anxiety and personality disorders) may present symptoms similar to those of ADHD (Fatseas et al. 2012). Such matters make the assessment and diagnosis of ADHD difficult in SUD populations (Crunelle et al. 2018).

Furthermore, individuals with SUD who have also been diagnosed with ADHD (SUD + ADHD) challenge SUD treatment, because they transition more rapidly and more severely from substance use (SU) to SUD (Kim et al. 2006; Moura et al. 2013), drop out SUD treatment earlier (Levin et al. 2004), and are more frequently afflicted with other psychiatric disorders (van Emmerik-van Oortmerssen et al. 2014) than SUD patients without ADHD.

Increasingly investigated as a secondary outcome measure in health-care research (Brod et al. 2006; Coghill 2010; Laudet 2011; Picci et al. 2014), the construct of quality of life (QoL) is defined as how we experience our circumstances, goals and interests in life, based on the value system and cultural context in which we live (The WHOQOL Group 1998). As the complexity associated with SUD plus ADHD affects individuals in nearly all life domains (Gjervan et al. 2016; Uchida et al. 2015; Umar et al. 2017), interventions targeting this group of patients should aim to improve their QoL.

When compared cross-sectionally, SUD + ADHD and SUD – ADHD patients seem to have no differences in QoL (Kronenberg et al. 2015). However, to our knowledge only one study has prospectively (2 months after treatment) considered the QoL of these individuals (without a comparison group) (van Emmerik-van Oortmerssen et al. 2019). That study found that the ADHD symptoms among SUD + ADHD individuals had improved, but there were no changes in QoL. There is evidence that improved QoL in ADHD is associated with psychopharmacological treatment (e.g., Agarwal et al. 2012). Therefore, the QoL in SUD + ADHD patients may benefit from such treatment as well. Naturalistic follow-up studies concerning QoL in SUD + ADHD patients are still scarce. Such studies may contribute to the literature by identifying factors that improve the QoL of SUD + ADHD patients, which can be integrated into SUD treatment. For these reasons, we were interested in investigating the following in the present naturalistic study:

1. To compare the QoL of SUD patients at baseline and at a 12-month follow-up after SUD treatment with cross-sectional data from a national population sample.
2. To investigate whether there were differences in QoL between SUD + ADHD and SUD – ADHD patients at baseline and follow-up.

## Materials and methods

### Participants

Sixteen SUD + ADHD and 87 SUD – ADHD participants signed an informed consent form at the University Hospital of Northern Norway (between February 2010 and July

2012). Ethical approval was granted by regional committees for medical and health research ethics, REK sør-øst B, 2009/1355b. Study participants were followed up at three points after SUD treatment (at 3, 6 and 12 months, as shown in Fig. 1). The present study reports on 36 SUD patients, eight SUD + ADHD patients and 28 SUD – ADHD patients (34.9% of the original sample of 103 patients), who were reached at the longest observation time available, the 12-month follow-up (hereafter referred to as “follow-up”). This is because although some improvements in QoL have been observed as early as 6 months after SUD treatment (Pasareanu et al. 2015), studies indicate that QoL reaches stability in one to 2 years after addiction treatment, granted considerable substance reduction or abstinence (Chou et al. 2013; Daepfen et al. 2014; Laudet 2011). Furthermore, because psychopharmacological treatment is associated with improved QoL in ADHD (Agarwal et al. 2012), we report the psychopharmacological treatment status of SUD + ADHD individuals reached at the longest observation time. Additional information about recruitment and patient characteristics is presented in Flores-García et al. (2016).

The self-reported QoL of the two SUD patient groups were compared against QoL data from a national population sample (NPS), reported in a cross-sectional study by Mathiesen et al. (2012). This study consisted of 1230 randomly selected adults drawn from the Norwegian National Register.

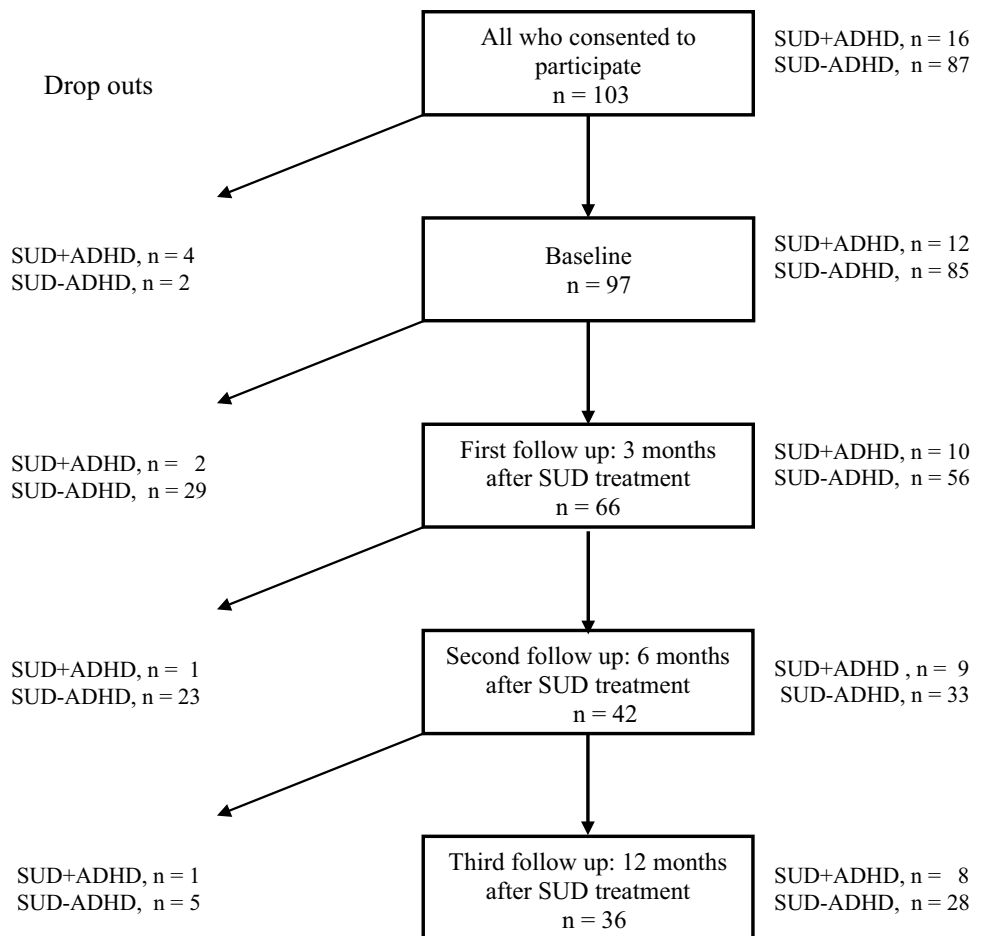
### Procedure

The study participants, all of whom had previously received detoxification treatment, were assessed during an SUD treatment of about 2 months. Baseline assessments were commonly completed 1–3 weeks after initiation of SUD treatment. Follow-ups were conducted either by outpatient services (i.e., via telephone, postal mail, home visits, or with the assistance of a contact person chosen by the participant from his/her local public support system) or by 1-week inpatient readmissions. Depending on time constraints, these follow-up assessments were conducted either by the clinician with whom the study participant had collaborated most frequently or by the first author (LF). It was not always feasible for participants to adhere to the original follow-up schedule. In such cases, delays of up to 2 months were allowed. All participants were offered reading and writing assistance.

### ADHD diagnosis and pharmacological treatment

According to the national guideline on ADHD (Norwegian Directorate for Health and Social Affairs 2007), the assessment and diagnosis of ADHD in adults (International Classification of Diseases 10th revision, ICD-10) (World Health Organization 1992) involve the assessment of impairment in

**Fig. 1** Flowchart for SUD patients with and without ADHD from baseline to follow-up. *Note SUD* substance use disorders, *ADHD* attention deficit hyperactivity disorder



childhood and adulthood (i.e., the extent to which the ADHD symptoms have affected functioning in the different life domains), assessment of concurrent psychopathology and differential diagnosis and collection of collateral information from the individual's parents and other relevant informants. This procedure must be conducted by authorized health-care practitioners (physicians/psychologists). Information about those participants fulfilling the criteria for an ADHD diagnosis was extracted from their medical records. The eight SUD + ADHD patients (mean age at baseline  $41.5 \pm 7.9$ ; age range 30–50) reached at follow-up were all assessed in their adulthood (mean age at assessment  $37.5 \pm 11.9$ , age range 18–50). The time from diagnosis to entering the study at baseline was  $4.0 \pm 4.4$  years. At baseline, five of the eight SUD + ADHD patients had recently started psychopharmacological treatment with methylphenidate (MPH).

### Baseline characteristics and re-assessment at follow-up

As previously reported, at baseline, SUD + ADHD patients were younger, showed more severe ADHD symptomatology, more amphetamine addiction and self-reported less alcohol

use than SUD – ADHD patients (Flores-Garcia et al. 2016). In this study, the eight SUD + ADHD and 28 SUD – ADHD patients were compared regarding QoL, ADHD symptoms and SUD symptoms at baseline and follow-up.

### Measures

At baseline, DSM-IV Axis I current comorbid disorders were assessed by the Mini International Neuropsychiatric Interview (M.I.N.I. PLUS) (Sheehan et al. 1994). Axis II disorders were assessed by the Structured Clinical Interview for DSM-IV (SCID II, First et al. 1995), but only when the treatment staff considered it necessary.

SUD patients were assessed for QoL, ADHD symptoms and substance use at baseline and follow-up. A brief description of the instruments used is presented below.

QoL was assessed using the World Health Organization questionnaire, short version (WHOQOL-BREF), which consists of 26 items measuring four QoL domains: physical health (domain 1); psychological health (domain 2); social relationships (domain 3); and environment (domain 4) (Mathiesen et al. 2012; The WHOQOL Group 1998). Answer alternatives are on a five-point Likert scale varying

from 1 (lowest) to 5 (highest). Elevated scores indicate better QoL. In the NPS, the internal consistency reliability (Cronbach's  $\alpha$ ) ranged from 0.63 (domain 3) to 0.84 (domains 1 and 2) (Mathiesen et al. 2012). In this study, baseline Cronbach's  $\alpha$  coefficients ranged from 0.71 (domain 3) to 0.84 (domain 4) and at follow-up from 0.68 (domain 3) to 0.89 (domain 2). A systematic review and meta-analysis showed that WHOQOL-BREF is able to detect meaningful changes in QoL across different patient populations even though when they are small (Skevington and Epton 2018).

The adult ADHD Self-Report Scale (ASRS) measures the frequency of experiencing the core ADHD symptoms of inattention, and hyperactivity/impulsivity is experienced (Kessler et al. 2005). The 18 items comprising the ASRS are divided into part A and part B. Answer alternatives range from 0 (never) to 4 (very often). High scores indicate high symptom severity. Part A is a six-item scale that covers the most predictive symptoms of ADHD, whereas part B covers additional symptoms associated with the clinical picture of ADHD (Kessler et al. 2007; Taylor et al. 2011). The ASRS part A is frequently used in studies aiming to identify individuals who potentially have ADHD in SUD populations (e.g., van de Glind et al. 2013). In general, the cut-off score recommended to carry a full assessment of ADHD is  $\geq 14$ . A recent study specifically performed in SUD populations recommended a lower cut-off score of  $\geq 11$  (Luderer et al. 2018) to gain adequate sensitivity for ADHD in SUD. In the present study, part A and part B of the ASRS were analyzed to elucidate changes from baseline to follow-up in the additional symptom burden of those diagnosed with SUD + ADHD, as compared to SUD – ADHD patients. Cronbach's  $\alpha$  coefficients reported previously for part A and part B of the ASRS were 0.86 and 0.93, respectively (Flores-García et al. 2016). In this study, the Cronbach's  $\alpha$  coefficients for part A and part B were 0.86 and 0.90 at the baseline and 0.84 and 0.86 at follow-up, respectively.

Self-reported alcohol use was measured by the screening instrument Alcohol Use Disorder Identification Test (AUDIT) (Babor et al. 2001) based on the DSM-IV diagnostic criteria for SUD (American Psychiatric Association 1994), consisting of ten questions, and answer alternatives vary from 0 (never) to 4 (daily). The maximum possible score is 40. Scores  $> 8$  indicate risk of harmful drinking, scores  $> 16$  indicate medium level of drinking harmfully and scores  $> 20$  indicate excessive drinking (Saunders et al. 1993). AUDIT has previously shown an internal consistency coefficient of 0.77 (Rumpf et al. 2013) compared to 0.94 at both observation times in this study.

The screening instrument Drug Use Disorder Identification Test (DUDIT), consisting of 11 questions measured non-alcohol SU (Berman et al. 2005). Similar to the AUDIT, the answer alternatives in the DUDIT range from 0 (never) to 4 (daily). The maximum score is 44. Scores  $> 2$  for women

and  $> 6$  for men are considered problematic use, whereas scores  $> 25$  indicate substance addiction (Berman et al. 2005). The DUDIT has shown Cronbach's  $\alpha$  coefficients of 0.90 (Hildebrand 2015). In this study, they were 0.98 and 0.96 at the baseline and 12-month follow-up, respectively.

## Statistical analyses

Survival analysis with the Cox proportional regression model was applied to all data ( $n = 103$ ) to locate possible factors explaining drop-outs at follow-up. Time in days from baseline until the date of drop-out, date of the individual 12-month follow-up appointment or death date, whichever came first, was recorded for all 103 SUD patients. Survival times for individuals not dropping out were recorded as censored, according to the terminology of survival analysis.

Nonparametric Mann–Whitney  $U$  (scale variables) and Fisher's exact tests (count variables) were chosen to compare the NPS and SUD groups due to the small size of the SUD + ADHD group. A one-sample  $U$  test compared the SUD group with the NPS mean value, and the baseline to follow-up change. Two-sample  $U$  test compared SUD + ADHD versus SUD – ADHD.

Due to the many statistical tests in this study, significant results were restricted to  $p$  values below 0.01, whereas results below 0.05 were considered tendencies. The statistical packages SPSS v.22 (IBM Corp. 2013) and the statistical computing language R (R Core Team 2015) were used for the analyses. In particular, we utilized R-functions: `wilcox.test`, `fisher.test`, `glm`, and `coxph` in the survival package.

## Results

### Sociodemographic and clinical characteristics at baseline and follow-up

#### Sociodemographic characteristics

The sample comprised 28 males and eight females aged between 28 and 65 (Mean age  $47.5 \pm 9.6$  years). When comparing the SUD groups with the NPS, three out of four SUD patients were men, while the gender ratio was nearly equal in the NPS. Individuals in the NPS were more often employed than in either SUD patient group. Additionally, NPS individuals were more likely to cohabit and had more years of completed education than SUD – ADHD patients. The age differences between the NPS and SUD groups were not significant (Table 1).

From baseline to follow-up, five male SUD – ADHD patients had died, of which the majority consumed multiple substances, predominantly alcohol. None of the SUD + ADHD patients had died at follow-up. A survival

**Table 1** Sociodemographic characteristics of SUD+ADHD ( $N=8$ ) and SUD-ADHD ( $N=28$ ) patients compared to a Norwegian Population sample (NPS) ( $N=1230$ )

	1. SUD+ADHD %		2. SUD-ADHD %		3. NPS %		1. vs. 2.	1. vs. 3.	1. vs. 3.
							$p^a$	$p^a$	$p^a$
Age <sup>b,c</sup> $M$ (SD)	41.5 (7.9)		49.5 (9.5)		46.6 (14.7)		0.031*	0.107	0.103
Males	6	75	22	78.6	556	45.2	1.00	0.151	0.000***
Cohabitant	3	37.5	2	7.1	772	62.7	0.061	0.159	0.000***
Education							0.766	0.053	0.001**
Primary and secondary school	2	25	9	32.1	145	14.8			
High school	5	62.5	13	46.4	450	36.6			
Higher education (University/College)	1	12.5	6	21.4	602	48.9			
Missing	–	–	–	–	33	2.7			
Occupational status							0.248	0.004**	0.000***
Employed	1	12.5	6	21.4	820	66.6			
Unemployed	6	75	22	78.6	306	24.9			
Under education <sup>d</sup>	1	12.5	–	–	92	7.5			
Missing	–	–	–	–	12	1.00			

SUD substance use disorder, ADHD attention deficit hyperactivity disorder,  $M$  mean,  $SD$  standard deviation

\* $p \leq 0.05$ ; \*\* $p \leq 0.01$ ; \*\*\* $p \leq 0.001$ , two-tailed

<sup>a</sup>Fisher's Exact test for comparison of categorical variables.  $U$ : Mann-Whitney  $U$  test for comparison of scale variables

<sup>b</sup>Pooled data from NPS

<sup>c</sup>Age Median (range): SUD+ADHD 41.5 (20); SUD-ADHD 50.5 (37)

<sup>d</sup>After completed compulsory education

analysis of all 103 SUD patients at baseline (see flow chart) revealed that younger patients and those cohabitating with a partner had an increased likelihood of dropping out at follow-up compared to older SUD individuals and those with no cohabitant ( $HR = 1.05$ ,  $p = 0.001$  and  $HR = 2.5$ ,  $p = 0.008$ , respectively). However, there were no significant differences between SUD+ADHD and SUD-ADHD patients concerning dropping out at follow-up. In the SUD+ADHD group, 50% of the follow-up assessments were conducted through outpatient services and 50% as inpatient readmissions. In the SUD-ADHD group, the corresponding proportions were 57.7% and 42.3%, respectively.

### Clinical characteristics

At baseline, five SUD+ADHD patients were receiving MPH. In our previous study, we reported the baseline ASRS scores of the original samples of SUD+ADHD and SUD-ADHD patients. In that study, SUD+ADHD patients showed significantly higher scores on part A and part B of the ASRS compared to SUD-ADHD patients (Flores-Garcia et al. 2016). In the present study, we also investigated whether the eight SUD+ADHD patients showed higher baseline ASRS scores on part A and part B compared to the 28 SUD-ADHD patients. As Table 2 shows, compared to SUD-ADHD patients, SUD+ADHD patients showed baseline tendencies ( $p < 0.05$ ) toward a higher ADHD

symptom frequency. The recommended cut-off score for ASRS part A for a further assessment of ADHD is  $\geq 14$ . For SUD populations, recently an ASRS part A cut-off score of  $\geq 11$  has been suggested (Kessler et al. 2007; Luderer et al. 2018; Taylor et al. 2011). As a reference, 75% in the SUD+ADHD group (already diagnosed as having ADHD) reported scores above the recommended cut-off score of  $\geq 14$  for the ASRS part A and 12.5% reported a cut-off of  $\geq 11$ . Among the SUD-ADHD patients, the corresponding proportions were of 32.1% and 21.4%, respectively. SUD+ADHD patients also had higher rates of amphetamine SUD ( $p < 0.01$ ) and less alcohol use ( $p < 0.05$ ) than SUD-ADHD patients. Neither group differed statistically in baseline non-alcohol SU, or in other clinical variables. However, psychiatric comorbidity was more frequent among SUD-ADHD patients.

At follow-up, seven of the eight SUD+ADHD patients were treated with MPH. In terms of ADHD symptomatology, no statistical differences were observed between SUD+ADHD and SUD-ADHD patients (Table 2). Furthermore, at this observation point, 37.5% of the SUD+ADHD group still reported ASRS screener scores at the cut-off of  $\geq 14$  and 12.5% had scores at a cut-off of  $\geq 11$ . In the SUD-ADHD group, the corresponding proportions were 17.8% and 28.5%, respectively. In addition, the SUD groups reported reduced alcohol use, particularly SUD-ADHD patients. The differences between



**Table 2** Clinical characteristics of SUD + ADHD ( $N=8$ ) and SUD – ADHD patients ( $N=28$ ) at baseline and 12-month follow-up

	Baseline		$p^{\wedge}$	Follow-up		$p^{\vee}$		
	SUD + ADHD			SUD – ADHD				
	<i>n</i>	%		<i>n</i>	%			
Previous SUD treatment <sup>a</sup>	8	100	21	75.0	0.309	NA	NA	NA
Previous treatment for mental health problems <sup>b</sup>	7	87.5	22	81.5	1.00	NA	NA	NA
<i>Other mental disorders-current</i>						NA	NA	NA
Schizophrenia	1	12.5	1	3.6				
Affective disorders	–		5	17.9				
Anxiety disorders	–		2	7.1				
<i>SUD diagnoses</i>					0.217	NA	NA	NA
One diagnose	3	37.5	19	67.9				
Two or more diagnoses	5	62.5	9	32.1				
<i>SUD diagnosis specified by substance</i>						NA	NA	NA
Alcohol	4	50.0	24	85.7	0.054			
Cannabis	1	12.5	6	21.4	1.00			
Amphetamines	5	62.5	2	7.1	0.003**			
Benzodiazepines	1	12.5	5	17.8	1.00			
Opioids <sup>c</sup>	2	25.0	3	10.7	0.305			
<i>Number of self-reported substances of abuse</i>					0.422	NA	NA	NA
One substance	4	50.0	19	67.9				
Two or more substances	4	50.0	9	32.1				
	<i>M (SD)</i>		<i>M (SD)</i>			<i>M (SD)</i>	<i>M (SD)</i>	
Age of onset of substance use	12.1 (2.9)		16.0 (7.9)		0.072	–	NA	NA
AUDIT	14.2 (13.0)		24.9 (10.7)		0.041*	8.6 (7.9)	14.0 (12.1)	0.248
DUDIT	15.5 (13.9)		10.5 (15.6)		0.224	5.4 (5.5)	4.9 (10.4)	0.160
ASRS part A	16.4 (4.7)		11.0 (5.3)		0.022*	10.8 (4.3)	9.7 (4.6)	0.632
ASRS part B	32.1 (7.2)		23.1 (8.0)		0.016*	20.0 (5.8)	18.9 (7.0)	0.690

SUD substance use disorder, ADHD attention deficit hyperactivity disorder, *M* mean, *SD* standard deviation, *Mdn* median, ASRS Adult ADHD Self-Report Scale

\* $p \leq 0.05$ ; \*\* $p \leq 0.01$ , two-tailed

<sup>^</sup>Fisher's Exact test

<sup>^</sup>Mann–Whitney *U* test

<sup>a</sup>Inpatient and outpatient

<sup>b</sup>Unspecified if inpatient or outpatient

<sup>c</sup>Including opioid replacement therapy

SUD + ADHD and SUD – ADHD patients found at baseline ( $p < 0.05$ ) were nonsignificant at follow-up (see Table 2).

### QoL at baseline and follow-up compared to the NPS

Preliminarily, we compared the QoL of the SUD patients who were reached at the 3-month and 6-month follow-ups to the NPS. This is to verify that the results from a larger sample showed trends similar to the results from the sample reached at follow-up. The results from the 3- and 6-month follow-ups were similar to those observed at baseline (data available on request).

Comparisons in QoL between the SUD patients and the NPS are reported in Table 3 and Fig. 2. SUD patients in total reported significantly lower QoL on all domains ( $p$ 's  $< 0.001$ ) than the NPS at both observation times.

SUD + ADHD patients reported a 3.6–5.0 lower average baseline QoL on all domains compared to the NPS, but this was nonsignificant in domain 3 ( $p = 0.057$ ) and only tendencies in domain 1, 2 and 4 ( $p = 0.014$ ). SUD – ADHD patients had significantly lower QoL at baseline in all domains ( $p$ 's  $< 0.000$ ) compared to the NPS.

At follow-up, score differences in QoL between SUD + ADHD patients and NPS were smaller (1.4–2.4) than those observed at baseline and nonsignificant in all domains

**Table 3** Quality of Life in SUD + ADHD ( $N=8$ ) and SUD – ADHD ( $N=28$ ) patients at baseline and 12-month follow-up compared to a Norwegian Population sample ( $N=1230$ )

QoL (WHOQOL-BREF) domains	SUD patients at baseline (SUD-BL)			SUD-BL vs. NPS <sup>a</sup>			SUD patients at 12 months (SUD-12 m)			SUD-12 m vs. NPS <sup>a</sup>		SUD-12 m vs. SUD-BL
	<i>M</i> (SD)	<i>Mdn</i> (Range)	<i>p</i> <sup>b</sup>	<i>M</i> (SD)	<i>Mdn</i> (Range)	<i>p</i> <sup>b</sup>	<i>M</i> (SD)	<i>Mdn</i> (Range)	<i>p</i> <sup>b</sup>		<i>p</i> <sup>c</sup>	
<i>All SUD patients N=36</i>												
Physical health (domain 1)	12.0 (3.0)	12.3 (11)	0.000***	12.8 (3.1)	13.1 (16)	0.000***	12.8 (3.1)	13.1 (16)	0.000***		0.098	
Psychological health (domain 2)	11.6 (2.9)	11.3 (11)	0.000***	12.4 (3.3)	12.7 (12)	0.000***	12.4 (3.3)	12.7 (12)	0.000***		0.045*	
Social relationships (domain 3)	11.2 (3.6)	11.3 (16)	0.000***	12.4 (3.6)	12.7 (15)	0.000***	12.4 (3.6)	12.7 (15)	0.000***		0.069	
Environment (domain 4)	13.2 (2.8)	13.0 (11)	0.000***	13.9 (2.8)	14.3 (11)	0.001**	13.9 (2.8)	14.3 (11)	0.001**		0.129	
<i>SUD + ADHD patients N=8</i>												
Physical health (domain 1)	11.0 (2.2)	10.9 (7)	0.014*	13.6 (2.5)	14.0 (8)	0.016*	13.6 (2.5)	14.0 (8)	0.016*		0.039*	
Psychological health (domain 2)	11.3 (2.9)	12.0 (9)	0.014*	13.5 (3.2)	15.0 (9)	0.183	13.5 (3.2)	15.0 (9)	0.183		0.023*	
Social relationships (domain 3)	11.5 (4.4)	10.7 (15)	0.057	13.7 (2.9)	14.0 (8)	0.233	13.7 (2.9)	14.0 (8)	0.233		0.103	
Environment (domain 4)	12.1 (2.7)	12.5 (9)	0.014*	14.5 (2.5)	14.3 (7)	0.250	14.5 (2.5)	14.3 (7)	0.250		0.049*	
<i>SUD – ADHD patients N=28</i>												
Physical health (domain 1)	12.3 (3.2)	12.6 (11)	0.000***	12.6 (3.3)	13.1 (16)	0.000***	12.6 (3.3)	13.1 (16)	0.000***		0.559	
Psychological health (domain 2)	11.6 (3.0)	11.3 (10)	0.000***	12.1(3.3)	12.3 (12)	0.000***	12.1(3.3)	12.3 (12)	0.000***		0.333	
Social relationships (domain 3)	11.1 (3.4)	11.3 (13)	0.000***	12.0 (3.7)	11.3 (15)	0.001**	12.0 (3.7)	11.3 (15)	0.001**		0.243	
Environment (domain 4)	13.5 (2.8)	14.3 (10)	0.000***	13.7 (2.9)	14.3 (11)	0.002**	13.7 (2.9)	14.3 (11)	0.002**		0.620	

NPS Norwegian population sample, SUD substance use disorder, WHOQoL-BREF the World Health Organization Quality of Life self-report, short version, *M* mean, *SD* standard deviation, *Mdn* median

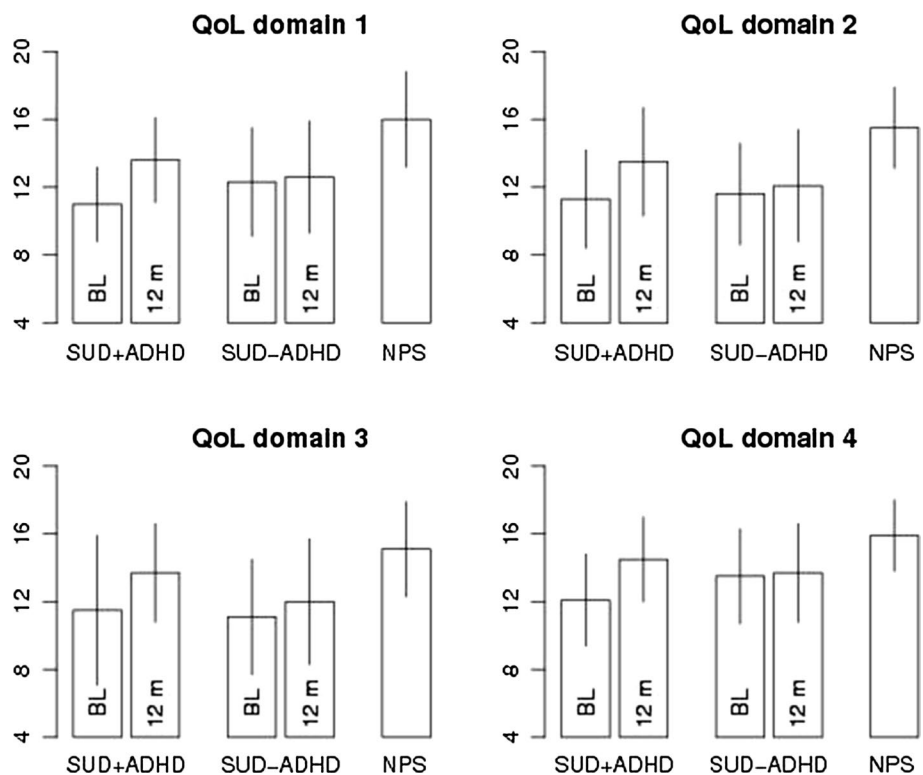
\* $p \leq 0.05$ ; \*\* $p \leq 0.01$ ; \*\*\* $p \leq 0.001$ , two-tailed

<sup>a</sup>QoL in the NPS,  $N=1230$ : physical health (domain 1):  $M=16.0$ ,  $SD=2.8$ ; Psychological health (domain 2):  $M=15.5$ ,  $SD=2.4$ ; social relationships (domain 3):  $M=15.1$ ,  $SD=2.8$ ; environment (domain 4):  $M=15.9$ ,  $SD=2.1$

<sup>b</sup>Mann–Whitney *U* test for comparisons between SUD patients and the NPS

<sup>c</sup>Wilcoxon signed-rank test for paired samples

**Fig. 2** Changes in quality of life from baseline to 12 months after SUD treatment among SUD + ADHD ( $N=8$ ) and SUD – ADHD ( $N=28$ ) patients compared to cross-sectional data from a NPS ( $N=1230$ ). Note The vertical lines represent  $1 \pm$  standard deviation. QoL quality of life, SUD substance use disorder, ADHD attention deficit hyperactivity disorder, NPS Norwegian population sample, *n* number, domain 1 physical health, domain 2 psychological health, domain 3 social relationships, domain 4 environment, BL baseline, 12 m 12 months after SUD treatment



except in domain 1 physical health where there was still a tendency of lower QoL compared to NPS ( $p=0.016$ ). The QoL among SUD – ADHD patients was almost unchanged and still significantly lower than the NPS (Table 3 and Fig. 2).

The two SUD groups reported similarly low QoL (0.3–1.4 point's difference) at baseline in all domains. From baseline to follow-up, only SUD + ADHD patients had a tendency of improved QoL which was present in domain 1, 2 and 4. However, the difference between the SUD groups at follow-up (0.8–1.7 point's difference) remained nonsignificant (physical health,  $p=0.390$ ; psychological health,  $p=0.229$ ; social relations,  $p=0.213$ ; and environment,  $p=0.542$ ) (Table 3 and Fig. 2).

## Discussion

The aims of the present study were (1) to compare the QoL of SUD patients both at baseline and at 12-month follow-up after SUD treatment with cross-sectional data from a NPS and (2) to investigate whether there were differences in QoL between SUD + ADHD and SUD – ADHD patients at both the baseline and the follow-up.

At both observation times, the SUD patients reported significantly lower QoL (all domains) than did the NPS. This is in line with results from studies comparing individuals with SUD (Tracy et al. 2012) and ADHD (Lensing et al. 2015) to the general population. The present results seem rational because for individuals with persistent disorders, such as SUD and ADHD, reaching a similar QoL as those in good general health may take substantial efforts at different levels.

When the SUD group was investigated by ADHD status, at a tendency level ( $p < 0.05$ ), SUD + ADHD patients showed improvements in QoL at follow-up. These improvements were observed specifically in domain 1 (physical health), domain 2 (psychological health) and domain 4 (environment). SUD – ADHD patients reported a nearly unchanged QoL from baseline to follow-up on all domains. Furthermore, five SUD + ADHD patients were treated with MPH at baseline and seven at follow-up. It is likely that those receiving MPH treatment at baseline would have reported a lower baseline QoL in the absence of MPH treatment, which would have meant larger differences in QoL at follow-up. However, the small sample size limited investigating this point further.

A systematic review and meta-analysis indicated that WHOQOL-BREF detects clinically meaningful changes in QoL (Skevington and Epton 2018). Therefore, we suggest that SUD + ADHD patients' enhanced QoL is reliable and clinically relevant. Although the present study is substantially limited by its small sample sizes, particularly regarding the number of SUD + ADHD patients, it begins

a discussion concerning the QoL over time of this patient group. The results may be explained either by issues specific to ADHD, such as reduced symptoms, reduced SUD symptoms or by more general issues associated with self-reporting. These possible explanations are considered in the following discussion.

There is scant research comparing the QoL of SUD + ADHD versus SUD – ADHD populations. A longitudinal study of individuals with another complex comorbidity, bipolar disorder, both with and without SUD (Mazza et al. 2009) reported no changes in QoL in both groups a year after treatment. In addition, there is little research comparing the QoL of individuals with ADHD with and without other psychiatric disorders. A longitudinal study in adolescents showed that ADHD symptoms and co-occurrent anxiety and depression symptoms greatly affected their QoL (Pan and Yeh 2017). Findings from these studies on SUD or ADHD plus psychiatric comorbidity conflict with the present results, which show increased QoL scores among SUD + ADHD patients at follow-up.

In the present study, most SUD + ADHD patients were diagnosed with an amphetamine SUD. Some studies of SUD + ADHD individuals with stimulant SUD have reported associations between central stimulant treatment and improved SUD and ADHD symptoms (Konstenius et al. 2014; Levin et al. 2015). Although those studies did not consider QoL, research on ADHD and SUD suggests that QoL increases as the symptoms of these disorders abate (Laudet 2011; Picci et al. 2014). In ADHD, psychopharmacological treatment is also associated with symptom reduction and improved QoL (Agarwal et al. 2012). Based on this body of research, one interpretation of the present findings is that improvements in QoL and ADHD symptoms in SUD + ADHD patients, particularly in those with stimulant SUD, were associated with MPH treatment. Nevertheless, implying that psychopharmacological treatment reduces symptoms in SUD + ADHD individuals with a specific SUD may be an oversimplification of the complexity of SUD, as these individuals may not have a specific substance use pattern (Clure et al. 1999) or it may change over time. As for the SUD – ADHD group, the proposition that QoL changes in parallel with SUD symptoms (Laudet 2011) is challenged by the present finding that despite reporting less SU at follow-up, SUD – ADHD patients showed almost unchanged QoL.

Studies suggest that specific ADHD symptoms are associated with QoL. For instance, severity of inattention seems to negatively affect QoL more than does hyperactivity/impulsivity (Weiss et al. 2010). Additionally, Gjervan et al. (2014) posited that inattention was specifically related to the vitality and emotional aspects of QoL and that hyperactivity/impulsivity was related to social functioning and mental health. In the present study, SUD + ADHD patients' specific ADHD symptoms might have been associated with

particular domains of QoL. However, it was not possible to test for associations between QoL and ADHD, nor could we investigate the potential effect of MPH on the QoL of SUD + ADHD patients. Such relationships should be further investigated in larger samples, using the same measurements to enable interpretation. An alternative interpretation is that because as individuals with ADHD tend to show positive appraisal bias (i.e., inflated self-perceptions) in self-reports (Owens et al. 2007), it is possible that this phenomenon contributed to SUD + ADHD patients' enhanced QoL evaluations. Finally, a more general interpretation of the present findings may relate to the bias implicit in prospective studies on QoL (Blome and Augustin 2015), including recalibration (i.e., understanding the questions differently when revisited) or to social desirability (i.e., seeing one-self in a positive light and seeking acceptance from others). Social desirability has been commonly observed in the self-reports of SUD individuals (Arab et al. 2014). Accordingly, due to recalibration, SUD + ADHD patients might have interpreted their QoL differently at follow-up compared to baseline. Additionally, due to social desirability, SUD + ADHD patients may have reported better QoL, believing that they were expected to show improvements at follow-up. However, as the SUD – ADHD patients' QoL self-reports remained unchanged, it is difficult to attribute the present results to either response-shift bias or social desirability.

It was not possible to determine clearly why SUD + ADHD patients reported higher QoL scores following SUD treatment, nor how exactly these improvements were meaningful for the patients. The need to prospectively investigate what SUD + ADHD patients consider essential to enrich their QoL is highlighted by these results. Future studies should be designed to ensure inclusion of a large sample size, the use of current guidelines and recommendations to diagnose ADHD in SUD patients and special caution in the case of naturalistic studies, because of the many uncontrolled variables inherent in these types of studies. As a suggestion for clinical practice, determining SUD + ADHD patients' baseline QoL, symptom severity, functional status and associated goals during SUD treatment could lead to individualized interventions involving various forms of support. Subsequently, these interventions should be revisited in collaboration with the SUD + ADHD patients' support systems.

### Limitations

This study has several limitations, mostly related to its small sample size, which compromised statistical inference and limited the data analysis. First, although eight out of 16 SUD + ADHD patients were reached at follow-up, overall, the retention rate was low (35%). Even though the survival analysis detected no specific variables explaining drop-out

from the study by ADHD status, the samples still may have been biased. Second, women, individuals with greater symptom severity and psychiatric comorbidity, which is a characteristic consistently reported in this patient group (van Emmerik-van Oortmerssen et al. 2014) were underrepresented in the study. Consequently, the SUD + ADHD group might have had relatively better mental health than individuals in other studies. Relatedly, the findings from ASRS part A suggested some cases of subthreshold ADHD (Crunelle et al. 2018), which we did not investigate. Third, the role of MPH treatment could not be investigated further. Fourth, the study lacked information on life-productivity/functionality outcomes (e.g., employment status, functionality in everyday tasks and goals), which is important to the QoL of adults with ADHD (Brod et al. 2006). Without information on patients' functional outcomes, it was not possible to elucidate possible associations between improved QoL and functionality among SUD + ADHD patients. Fifth, in some cases, follow-ups were not conducted precisely as scheduled. Thus, the timing of the self-reported QoL was not the same for all SUD patients. Some patients might have had access to treatment for SUD/mental health problems or other types of healthcare support between discharge and follow-up. In such cases, this access may have exerted an important protective effect against SU and may have influenced the QoL self-reports of these individuals. Conversely, we did not gather systematic information on relapse rates at follow-up, which might have affected participants' perception of QoL. Lastly, type of SUD treatment as a possible explanation for the present findings was outside the scope of the present study.

### Conclusions

When assessing 12 months following treatment, SUD patients in general showed a lowered QoL compared to individuals in the general population. When divided by ADHD status, SUD + ADHD patients reported increased QoL scores from baseline to follow-up, which did not differ significantly from the NPS in most QoL domains. However, no statistical difference between SUD + ADHD versus SUD – ADHD was observed at baseline nor at follow-up. Furthermore, SUD + ADHD patients reported a reduction (below cut-off) in ADHD symptoms as well as improvements in SUD symptoms. In spite of reporting a reduction in SUD symptoms at follow-up, SUD – ADHD patients' QoL remained unchanged, significantly differing from the NPS at both observation times. It was unclear whether factors associated with ADHD played a role in how SUD + ADHD patients evaluated their QoL. Determining whether SUD + ADHD patients' improvements in QoL are clinically meaningful should be complemented by information about patients' functional outcomes.

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## Compliance with ethical standards

**Conflict of interest** The authors declare no conflict of interests.

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