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Gradual improvement in functioning and mental distress during long-term outpatient SUD treatment – A prospective pre-post study

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ABSTRACT

Background: Globally, outpatient programs for substance use disorder (SUD) treatment have gained prominence. To assess the broader clinical implications of this trend we investigated shifts in functioning experienced by outpatients undergoing treatment.

Methods: We describe the clinical characteristics of a cohort of 93 SUD patients in a Norwegian outpatient treatment clinic. Using paired-samples t-tests, we examined changes in perceived functioning, mental distress, and other clinically relevant outcome variables in a 5-month time interval during the treatment course.

Results: We obtained follow-up data for 67 (72%) of the included patients, with no significant difference in patient-related factors between those who completed the treatment course and those who were not assessed at follow-up. Perceived functioning increased significantly from study inclusion (Time 0) (mean 19.8, standard deviation ± 8.8) to its conclusion (Time 1) (24.3, ±9.3; t (66) = 4.5, (95% CI: 2.5–6.5, $p < 0.001$). We also identified significant improvement in most other measured variables, including mental distress, self-reported sleep quality, restlessness, and obsessive thinking. Substance use–related variables showed a modest, non-significant improvement at T1.

Conclusion: During a 5-month course of outpatient treatment, patients' subjective experience of functioning improved significantly. Those with the lowest functioning levels at T0 improved the most. Structured monitoring may be a valuable clinical tool for personalizing intervention, enhancing treatment outcomes, and supporting the clinical decision-making process.

1. Background

Substance use disorder (SUD) represents a major public health challenge worldwide (GBD 2016 Alcohol and Drug Use Collaborators, 2018). This highly prevalent disorder is characterized by the same complex, relapsing disease course seen in many chronic conditions, with a high degree of psychiatric, somatic, and social comorbidity and low quality of life (QoL) (Jané-Llopis & Matytsina, 2006; McLellan et al., 2000). The intricate nature of the disorder renders it inherently challenging to effectively address and treat, and up until the early 1990ies, specialized healthcare for SUDs typically involved a residential treatment model. This entailed the provision of treatment within a specialized facility where individuals would reside for a specified period, ranging from a few weeks to several months, depending on their specific needs and treatment goals (Reif et al., 2014).

Over the past 30 years, however, there has been a pronounced shift in contemporary healthcare, including the SUD treatment system, away from primarily residential to increasingly more outpatient-based treatment (Abrams et al., 2018; Anderberg et al., 2021; Bouchery, 2021; Sosialdepartementet [Department of Social Affairs], 1991-92, ch. 5.1). A report on Norwegian interdisciplinary treatment for SUDs cited a 35% increase in outpatient consultations over a 4-year period (2013–2017)

Abbreviations: CI, Confidence interval; EuropASI, Symptom Severity Index, European Version; GSI, Global Severity Index; IOP, Intensive outpatient treatment; ORS, Outcome Rating Scale; QoL, Quality of life; SCL-10, Hopkins Symptom Checklist-10 items; SUD, Substance use disorders; SYRAAP, Survey of Readiness for AA Participation; VAS, Visual analog scale.

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(Helsedirektoratet., 2018), and outpatient treatment is now regarded as the first option in most SUD treatment services. Outpatient treatment is seen as more cost-effective and provides greater flexibility for individuals seeking treatment, allowing them to continue with their daily activities while receiving care. Inpatient treatment is still available for those who require it, but it is increasingly being used as a secondary option for those who do not benefit from outpatient treatment or who have more complex needs. Since there are several ways of reinforcing outpatient treatment, this path is less linear and may include various modes of interventions at different levels, such as detoxification, intermittent inpatient stays, periods of intensive outpatient treatment, often supplemented with participation in self-help groups.

Another major shift in contemporary view of addiction treatment is how we assess success in treatment. Traditionally, abstinence from drug use has been seen as the main outcome of interest. Recently, however, there has been a gradual shift towards a recovery-based rather than pathology-focused orientation within health care in general (Anthony, 1993; Laudet et al., 2009) and in the SUD treatment field in particular (White, 2005). As a result, attention has turned to outcome models that go beyond simply quantifying drug consumption (Bjornestad et al., 2020). Factors that are of main interest to include in these models are QoL and the related concepts of well-being, physical health, and mental distress (Laudet et al., 2009; Vederhus et al., 2016a). For instance, subjective well-being is consistently lower among individuals with SUD than in the general population (Miller et al., 2014) and among those with various somatic conditions (Donovan et al., 2005; Vederhus et al., 2016b). Thus, the low QoL experienced by the patient with SUD could serve to maintain and perpetuate the detrimental cycle of drug use.

Similar to the view of other chronic diseases, recovery from SUD has been defined widely as a dynamic process characterized by increasingly stable remission, both supported by and resulting in enhanced QoL (Kelly & Hoeppner, 2014). Laudet argues that the ultimate aim of SUD treatment should be to improve patient QoL through abstinence or significant reductions in substance use (Laudet, 2011). In this perspective, the SUD patient seeks help not only to achieve abstinence as an end goal but also as a means to escape the negative consequences of substance use, restore health, and gain a better life. Improved life satisfaction and enhanced mental health thus may deter the patient from relapsing into drug use so that the accrued benefits can be maintained. In other words, treatment gains in the form of increased personal well-being may protect against future drug use and enhance the likelihood of sustained remission. This hypothesis about QoL as a predictor of continued abstinence was also empirically supported by Laudet et al. (Laudet et al., 2009). Recent empirical efforts to increase our understanding of the recovery process have shown that four elements are at the core of the recovery process, including a process of personal growth; being honest with oneself; taking responsibility for the things one can change; and developing more appropriate coping mechanisms such as handling negative feelings without substance use (Zemore et al., 2023).

Attentiveness to multi-dimensional outcomes and patient experiences of improvement is therefore important. McLellan et al. suggest incorporating instruments for during-treatment evaluation into SUD treatment as a means to monitor ongoing changes in clinically relevant outcomes (McLellan et al., 2005). This approach is common in the management of other chronic illnesses (DuPont et al., 2015) and may include overall functioning, well-being, and relevant physiological variables such as mental distress, obsessive thinking, and sleep quality. Sleep problems are among the most often mentioned factors associated with SUD (Erga et al., 2022) and sleep disturbances are associated with reduced health-related QoL in patients with SUDs, which in turn can lead to a relapse into substance use (Magnée et al., 2015).

From a relapse prevention perspective, a valuable strategy would be tracking measures of psychological and emotional states, e.g., mental distress, restlessness, and obsessive thinking. Such states may induce "intrapersonal high-risk situations" (Larimer et al., 1999), by which elevated negative states represent threats to the recovery process and as such are important targets in avoiding relapse into substance use. Tracking such sentiments may be especially important in outpatient treatment settings where the patients are not observed on a daily basis, and can indicate whether or not the treatment is perceived as useful for the patient. High scores would indicate a high perceived usefulness, and a low score would be an indication that the approach should be adjusted in collaboration with the patient. The increased utilization of outpatient services within Norwegian addiction treatment in recent decades highlights the need for a more systematic investigation of these factors and the relationship between them (Helsedirektoratet., 2018).

The overall aim of this study was therefore to investigate factors related to outpatient SUD treatment by describing problem severity and clinically relevant characteristics of a cohort of patients in an outpatient clinic and how these factors change through the treatment course. Since the data stemmed from a previously reported experimental study (Gabrielsen, Clausen, Haugland, & Vederhus, 2022), the pre-assessment in the present study was conducted an average of 3 months after outpatient treatment initiation with a post-assessment after 5 months, reflecting an interim outcome of the treatment. Thus, the study presented here has an explorative, naturalistic design. As a main outcome, we examined whether SUD patients' perceived functioning changed during a 5-month outpatient treatment course. Additionally, we wanted to investigate whether any changes during this period could be detected in other clinically relevant outcomes such as mental distress, restlessness, obsessive thinking, self-reported sleep quality, and substance use.

2. Methods

2.1. Setting, design, and procedures

This study relies on data stemming from a previously reported randomized controlled trial on the use of neurofeedback in the treatment of SUD. For a more detailed description of the data collection procedures, please refer to our original publication (Gabrielsen et al., 2022). For this investigation, we used a one-group pre-post design to detect longitudinal changes in the group as a whole. The descriptive analyses included 93 patients enrolled in outpatient treatment at the Addiction Unit, Sørlandet Hospital, in Kristiansand, Norway, between September 2017 and March 2020. Furthermore, the study covered a 5-month observation period of 67 of these patients within a longer, low-intensity outpatient treatment course. Participants had been admitted to treatment a median of 3.6 months before study inclusion and remained in treatment 8 months after completion of the study period. The timepoint when the patient was included in the study is referred to as T0 and the completion of the 5-month study period as T1.

2.2. Outpatient treatment

Within the publicly financed interdisciplinary specialized services for SUD in Norway, outpatient treatment is often offered as a standalone intervention for moderate problem severity, in the form of structured, semi-regular (often weekly) sessions. It is considered a low-intensity intervention that can be scaled up with intensive outpatient programs (IOPs, defined as a minimum of 9 h of service a week in three, 3-hour sessions (McCarty et al., 2014)), or more intensive inpatient programs, if needed. There is no consensus as to what outpatient treatment should entail, but typical intervention methods include cognitive behavioral therapy or motivational interviewing, according to the therapist's training and the needs of the individual patient.

Participants in the original randomized controlled trial were recruited mainly from urban and suburban areas of the county of Agder (population 310,000), based on the following inclusion criteria: a SUD according to the ICD-10 criteria, age $\geq$ 18 years, understanding/speaking Norwegian, and admitted at least 4 weeks prior to study inclusion (Gabrielsen et al., 2022). Patients enrolled in the clinic's opioid maintenance program (methadone, buprenorphine) were excluded from

participation, as were patients with severe cognitive impairment or language deficiencies who could not comprehend or respond to the questionnaires. The Montreal Cognitive Assessment (MoCA) structured interview was used to assess cognitive impairment and we used the recommended cutoff as described by the MoCA manual (scores below 26 points on the 30 point scale) (Nasreddine et al., 2019). For a more detailed description of the participants, see published article (NN).

2.3. Instruments and measures

Perceived functioning was operationalized through the Outcome Rating Scale (ORS), a brief outcome measure designed to monitor client progress throughout the treatment course (Miller et al., 2003). The scale assesses four dimensions of patient functioning: 1) individual (personal functioning), 2) interpersonal (family, close relationships), 3) social role (work, school, friendships), and 4) overall (general sense of well-being) (Miller et al., 2003). Thus, the ORS also can be considered a brief well-being scale, with its emphasis on satisfaction with core life functions. The items were measured on four visual analogue scales (VAS), on which the respondents were asked to rate their perceived functioning in the different domains from "poor" to "good" on an unmarked, 10-cm horizontal line (Parkin & Devlin, 2006). The VAS scores were determined using a centimeter ruler from the end of the line on the left (score 0) to the point that the respondent had marked. The scores were totaled to obtain a final score, ranging from 0 to 40, with higher scores indicating better perceived functioning. The reliability of the ORS in the present sample was excellent, with a Cronbach's alpha at 0.91. The clinical cutoff has been set at 25, and a positive change ≥ 5 points is considered to indicate clinically reliable improvement (Miller & Duncan, 2004). For descriptive purposes, three groups were created based on a categorization of the baseline ORS scores. The groups were defined as "low", "moderate", and "high" functioning. The chosen categorization aimed to provide a general indication of functioning levels and to visually represent the changes in scores from the baseline assessment. The categorization was determined based on the established information that a clinically relevant change would be a minimum of 5 points (Miller & Duncan, 2004). Consequently, individuals with scores above the clinical cut-off were classified as "high functioning", those within a 5-point range below the cut-off (between 20 and 25) were categorized as "moderate functioning", and those below 20 were classified as "low functioning". We also examined changes in individual ORS items.

Mental distress was measured with the Hopkins Symptom Check List 10 (SCL-10). This 10-item index maps symptoms of anxiety (4 items) and depression (6 items) on 4-point Likert-type scales ranging from "not bothered at all" (1) to "extremely bothered" (4). The global severity index (GSI) constitutes the average of all items, with the highest score indicating greater symptom severity during the past week. A mean GSI score > 1.85 has been recommended as a threshold for indicating substantial mental health distress (Strand et al., 2003). The scale has been shown to be a valid indicator of mental distress and has been validated in a Norwegian setting (Strand et al., 2003). The reliability in the present sample was good, with a Cronbach's alpha at 0.84.

Relevant intrapersonal states, i.e., restlessness and obsessive thinking, were measured with an inverted VAS, where higher scores indicate more distress (Parkin & Devlin, 2006). VAS scales are often used in epidemiologic and clinical research to measure the intensity or frequency of various symptoms, especially those that range across a continuum from none to an extreme amount. From the patient's perspective, the feeling of restlessness appears continuous, and does not take discrete jumps, as a categorization of none, mild, moderate and severe would suggest (Miller et al., 2003).

The physiological variable "sleep quality" was measured on a similar VAS, but with values ranging from "very poor" on the left-hand side of the scale (lower values) to "very good" on the far right (higher values).

The Mini International Neuropsychiatric Interview, version 6.0, was used at T0 to confirm the SUD diagnosis (Sheehan et al., 1998). In the analysis, SUD diagnosis was dichotomized into alcohol use disorder or drug use disorder. Following the example of Vederhus et al., those with both alcohol and drug use disorders were coded as having alcohol use disorder (Vederhus & Kristensen, 2006). Substance use was assessed based on the European version of the Addiction Severity Index (EuropASI), a semi-structured interview designed for both clinical and research purposes (Kokkevi & Hartgers, 1995). Data on drug and alcohol use in the 30 days before the interview yielded a composite score ranging from 0 (no problem) to 1 (severe problem). The instrument was also used to record patient demographics, life context, and treatment history. At T0, we included an overall substance use severity measure, the Survey of Readiness for AA Participation (SYRAAP) severity subscale (Kingree et al., 2007). The five questions of the scale, e.g., "My substance use has hurt some other people" and "Using substances has interfered with my ability to deal with everyday problems", were rated on a five-point Likert type response format, from scale 1 (strongly disagree) to scale 5 (strongly agree). A higher mean score indicated higher severity. A previous sample from a detoxification unit had a mean score on the SYRAAP severity subscale of 4.2 (Vederhus et al., 2016a). Thus, we considered a score > 4 to reflect a serious substance use problem. The reliability of the scale in the present sample was very good, with a Cronbach's alpha at 0.89.

2.4. Statistical analysis

Descriptive statistics were used to report continuous and categorical variables. Changes in the continuous outcome variables from T0 to T1 were analyzed using a paired-sample *t*-test, with a corresponding 95% confidence interval (CI). We used Cohen's *d* to indicate effect size, with 0.2 to 0.5 considered a small effect size, 0.5–0.8 a moderate effect size, and > 0.8 a large effect size (Cohen, 1988). Changes in binomial variables were examined with the McNemar test. Statistical significance was set at $p < 0.05$, and all analyses were performed using IBM SPSS Statistics version 28.

3. Results

3.1. Participants

The mean age of the 93 participants was 38 years (range 19–66) (Table 1). Just over a third (34%) were women, and most (99%) had been born in Norway. Most had a high school education (M = 12.7 years), and almost 80% of the participants relied on some form of welfare benefits. It was a mixed population with both alcohol and drug use disorders; all participants had a long history of problematic substance use (mean approximately 10 years) and met the ICD-10 criteria for SUD (Sheehan et al., 1998). Five participants had injected substances during the past 12 months. Almost half of the patients were living alone (Table 1).

3.2. Changes at the 5-month follow-up

For the follow-up analysis, we reached 67 of the original 93 participants (72%). An attrition analysis of the variables at T0 between those who were assessed and those lost to follow-up at T1 showed no significant differences at inclusion in the study in terms of demographic data, substance use severity, and other clinical variables (Table 1).

The perceived functioning measured at T0 was low for most patients, with 72% having an ORS score below the 25-point clinical cutoff value (Table 2). At the 5-month follow-up, 46 patients (69%) reported a positive change in perceived functioning, and 29 (43%) had a 5-point or larger improvement on the ORS. The mean improvement was 4.5 (95% CI: 2.5–6.5, $p < 0.001$, Table 2). This change was of moderate effect size (Cohen's $d = 0.55$). Twenty-one patients (31%) reported either no change or a deterioration in ORS. A descriptive model following the low-, middle-, and high-functioning groups at T0 and the corresponding

Table 1
Characteristics of study participants at inclusion to the study, including attrition analysis showing the difference in baseline scores between patients who were reached versus patients who were not reached at T1.

Variable	Patients reached at T1 N = 67	Patients not reached at T1 N = 26	Full sample at baseline (*N* = 93)	Sig.
Age, years	38 (±12)	37 (±11)	38 (±12)	0.67
Sex, female	21 (31)	11 (42)	32 (34)	0.34
Education, years	12.8 (±3.1)	12.2 (±2.8)	12.7 (±2.9)	0.38
Proportion living alone	32 (48)	14 (53)	46 (49)	0.67
Proportion on welfare benefits (*n* = 92)	54 (80)	19 (76)	73 (79)	0.77
Main diagnosis[a]				
Alcohol dependence	28 (42)	11 (42)	39 (42)	1.0
Drug dependence	39 (58)	15 (58)	54 (58)	1.0
Years of problematic use[b]	9.8 (±8.6)	10.0 (±6.7)	9.9 (±8.0)	0.94
Injection use in the past 6 months (*n* = 90)	3 (4.5)	2 (8.3)	5 (6)	0.6
Self-rated substance use severity[c]	3.7 (±1.1)	4.0 (±0.8)	3.8 (1.0)	0.09
Perceived functioning	19.8 (±8.5)	19.6 (±7.8)	19.8 (±8.8)	0.46
Mental distress	2.4 (±0.6)	2.5 (±0.6)	2.40 (±0.62)	0.47
Sleep quality	3.4 (±2.7)	4.1 (±2.5)	3.9 (±2.7)	0.68
Restlessness	5.9 (±2.2)	6.2 (±1.8)	5.9 (±2.2)	0.68
Obsessive thinking	6.7 (±2.6)	6.9 (±2.1)	6.7 (±2.6)	0.33

Data are presented as *n* (%) or mean (standard deviation, ±). *P* value for group difference between those reached or not reached at T1.

[a] Main diagnosis was dichotomized into alcohol use disorder or drug use disorder. The presence of both alcohol and drug use disorder was coded as alcohol use disorder.

[b] Problematic use, as defined in EuropASI, was the consumption of 5 or more standard drinks at least 3 times weekly, or binge drinking on 2 consecutive days to a level that affected daily functioning. For drug use, only frequency was needed: 3 times weekly or 2 consecutive days.

[c] Severity and substance use were measured with the severity sub-scale in the Survey of Readiness for Alcoholics Anonymous Participation (SYRAAP), scale 1–5.

mean scores at the two timepoints showed that the overall improvement was mainly the result of improvements among those with the lowest functioning scores at T0 (Fig. 1). A further examination revealed that a similar proportion, between 60% and 70% of patients, reported improvement in each underlying ORS item (i.e., individual, interpersonal, social, overall), whereas roughly 30% reported deterioration for all items (Fig. 2).

The variable with the greatest improvement based on effect size evaluation was mental distress, which decreased from T0 to T1 (mean difference = -0.32; $t(65) = -5.54$, $p < 0.001$, 95% CI: −0.44 to −0.21). This improvement was of moderate effect size (Cohen's $d = 0.68$). The proportion of patients with an SCL-10 score above the clinical cutoff was reduced from 80% at T0 to 62% at T1.

There was a significant improvement in most other measured variables, including self-reported sleep quality, restlessness, and obsessive thinking (Table 2). However, these changes were of smaller effect size (Cohen's *d* from 0.2 to 0.5). The sample had a low T0 score for alcohol use (0.16) and drug use (0.06) with only a modest non-significant improvement in these substance use-related variables at T1 (Table 2).

4. Discussion

Roughly 3 months into their outpatient treatment course, i.e., the time of inclusion in this study (T0), most patients still experienced low levels of perceived functioning. Undergoing a further 5 months of outpatient treatment was associated with a significant improvement in perceived functioning, self-reported sleep quality, and psychological parameters. Moreover, substance use had not increased compared to values at T0, indicating low relapse rates for this group.

Several studies have previously noted a low level of functioning among the SUD population in inpatient settings (Vederhus et al., 2016b), including compared with patients who have somatic and chronic diseases (Donovan et al., 2005; Miller et al., 2014; Vederhus et al., 2016b). A Norwegian comparative study of patients in inpatient versus IOPs found a baseline ORS score of 21.9 for the cohort as a whole, which is slightly better (approximately 2 points) than the inclusion score in the current study (Solhaug et al., 2015). The mean improvement in that study at treatment end was 10.5 points for the IOP group. This increase is greater than in the present study, which demonstrated a mean improvement close to that described as a clinically reliable change (approximately 5 points) (Miller & Duncan, 2004). The greater improvement given for the IOP group in the previous report may be explained in part by the more comprehensive and intensive nature of the IOP compared with a standard outpatient program which is usually much less intensive. Moreover, the improvement in perceived functioning in the present study possibly would have been greater if the T0 values had been measured at treatment initiation rather than at several weeks into treatment.

Considering perceived functioning changes in the different segments (low-, middle-, and high-functioning scores), it was evident that those with markedly reduced functioning at T0 experienced the most pronounced progress. This pattern is similar to that described in a previous study at a detoxification center (Vederhus et al., 2016a) and may not be surprising: People with the lowest scores have more "room for

Table 2
Self-reported changes in subjective functioning, mental distress, sleep quality, restlessness, obsessive thinking, and substance use among study respondents (*n* = 67).

	Inclusion (T0)	5 months after (T1)baseline (T1)	Mean difference (95% CI)	*T*-test value (df)	*P*	Cohen's *d*
Perceived functioning[a]	19.8 (±8.8)	24.3 (±9.3)	4.5 (2.5–6.5)	4.5 (66)	<0.001	0.55
Proportion < 25	48 (72)	33 (49)	–		<0.001	–
Mental distress[b]	2.40 (±0.62)	2.07 (±0.59)	-0.32 (-0.44/-0.21)	-5.5 (65)	<0.001	0.68
Proportion ≥ 1.85 (*n* = 66)	53 (80)	41 (62)	–		0.012	–
Sleep quality[c]	3.9 (±2.7)	5.2 (±2.9)	1.3 (0.6–2.0)	3.5 (66)	<0.001	0.43
Restlessness[c]	5.9 (±2.2)	5.0 (±2.8)	-0.9 (-1.5/-0.2)	-2.8 (66)	0.003	0.34
Obsessive thinking[c]	6.7 (±2.6)	5.6 (±2.7)	-1.0 (-1.8/-0.3)	-2.8 (66)	0.004	0.34
Alcohol use[d]	0.16 (±0.19)	0.13 (±0.19)	-0.03 (-0.07/0.01)	-0.4 (66)	0.107	0.20
Drug use[d]	0.06 (±0.10)	0.03 (±0.07)	-0.02 (-0.04/0.00)	-0.2 (66)	0.094	0.20

Only those who reported scores at both time points are included in the table (*n* = 67). Data are presented as mean (standard deviation, ±) or *n* (%). *P* values were obtained with the paired *t*-test for continuous or McNemar test for categorical variables.

[a] Outcome Rating Scale (ORS), scale 0–40, clinical cutoff = 25.

[b] SCL-10, global score index, scale 1–4, clinical cutoff = 1.85.

[c] Measured with visual analogue scales, 0–10.

[d] EuropASI composite score, scale 0–1.

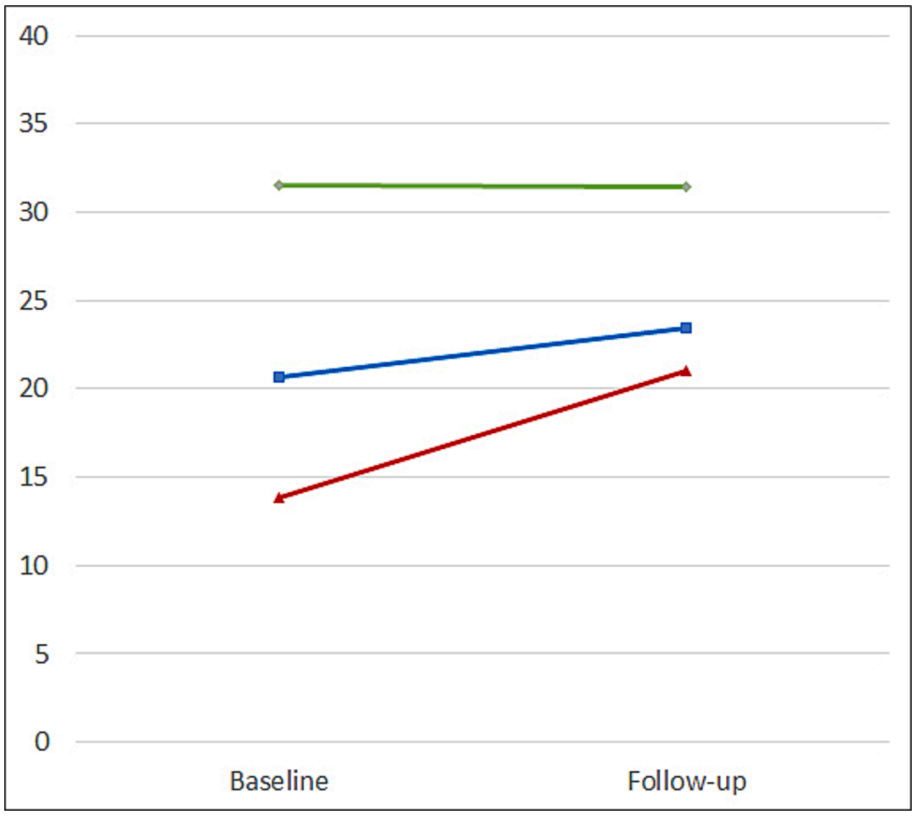

Fig. 1. Changes in perceived functioning, measured with the Outcome Rating Scale (ORS; score range 0–40), from inclusion (T0) to follow-up (T1) based on the low, moderate, and high segments of the ORS score at T0 ($n = 67$). *Green line* indicates scores of the highest functioning group at T0 (≥25). *Blue line* indicates change for patients with near-to-normal ORS at T0 (20–25). *Red line* indicates change for patients with markedly reduced ORS score at T0 (<20).

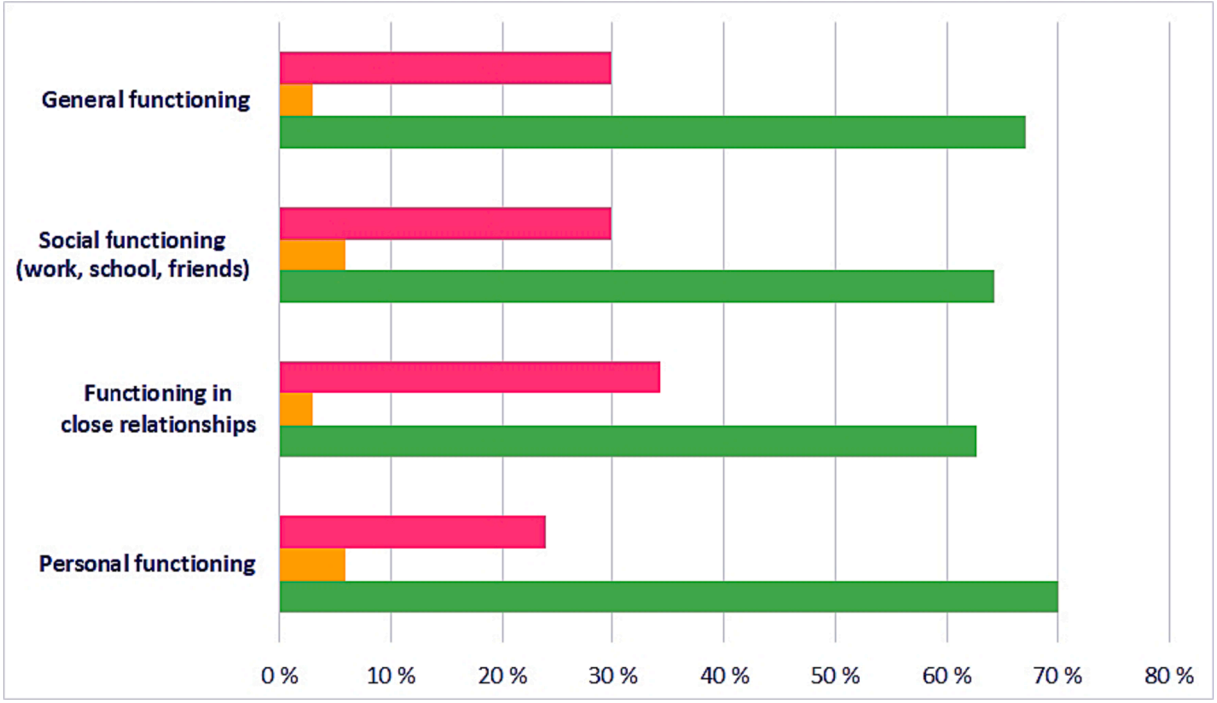

Fig. 2. Details of proportions (%) of patients showing changes in the perceived functioning score as measured with the four items of the Outcome Rating Scale (ORS) ($n = 67$). *Red bar* indicates at least a 0.1-point decrease in the score, *yellow bar* indicates no change (less than a 0.1 change), and *green bar* indicates at least a 0.1-point improvement.

improvement," i.e., there is a "ceiling effect" on improvement for those in the higher functioning group. It must be noted, though, that in spite of a large improvement at T1, the patients with the lowest functioning at T0 still had mean scores below the clinical cutoff after 5 months and had not reached the scores of those in the highest functioning group. The score distribution highlights the group of patients who may need a more intensive treatment approach. It also raises the discussion of whether clinical resources should be more unevenly distributed, so that those in the highest functioning group receive less and those in the lowest functioning groups receive more clinical attention. In any case, individually tailored treatment approaches designed to improve functioning and QoL may yield improvements for all patients if such individual and during-treatment monitoring were to be applied clinically.

We found a level of mental distress equivalent to that noted in similar populations and settings. For example, a study of a community-based outpatient program for cannabis cessation found a baseline GSI score in the same range as in the present study, with 74% in the clinical range of distress (Vederhus et al., 2020). In the current work, the corresponding proportion was 80%, with a decrease to 60% at T1. This trajectory is in line with a previous study which has reported a reduction in psychological distress during the initial phases of treatment (Erga et al., 2021). Although this result is encouraging, the mean score was still above the clinical cutoff point after 5 months of treatment, demonstrating the considerable symptom severity that these patients experienced and the potential for further improvements.

Self-reported sleep quality, restlessness, and obsessive thinking were included as variables that are typically referred to as "intrapersonal" risks in a relapse prevention perspective (Larimer et al., 1999). While improvement in these internal state variables was encouraging in the present patient group as a whole, such variables may also serve as examples of factors that are important to monitor in each patient's treatment process. This recognition is relevant because elevated levels of deprivation and/or distress in these areas can lead to undesirable relapse into substance use. For instance, the bidirectional relationship between sleep disturbances and substance use is well documented. While drug use may cause sleep dysfunctions that further promote chronic use, sleep disorders in turn are risk factors for excessive substance use and their severity can predict the prognosis of SUD (Valentino & Volkow, 2020). The monitoring of such variables is thus important because different needs may require differently tailored treatment responses.

Substance use was not substantially reduced in the present sample. One reason may have been the low substance use severity measured at T0 (i.e., at 3 months into treatment). The inclusion criteria in the original study, with its focus on a specific intervention (neurofeedback), assumed a certain level of stability of the participants. Hence, the composite scores for substance use (alcohol and drugs) were markedly lower than those found in, for example, patients admitted to detoxification in the same treatment setting in a previous study, who had scores roughly 3 times higher for alcohol and 4 times higher for drug use (Vederhus et al., 2016a). Thus, for the present participants, there was limited room for improvement in this variable, or a "floor effect", perhaps reflecting an average of 3 months of prior SUD treatment.

Outpatient treatment is often encouraged as an intervention following a residential treatment program, and before (or parallel to) participation in more extensive, longer-term, and less intensive programs, such as those administered by mutual aid organizations (Sobell & Sobell, 2000). However, there are no general recommendations for optimal length of treatment for outpatients in our healthcare system, and the transition of care from one step to the next can rest on an arbitrary decision based on the patient's progress and a therapist's clinical judgment, as well as resource capacity and funding. Outpatients are not shielded from outside influences in the same way as inpatients, so treatment monitoring tools might be particularly beneficial in the outpatient setting to evaluate recovery progress and aid the sequential treatment decision-making process. In this study, such monitoring tools were used twice during the investigational period for research purposes. If they also were systematically used clinically, the resulting information could help individualize the treatment approach according to specific patient needs and lead to a more patient-centered, efficient, and ultimately cost-effective treatment. In Norway for example, the health authorities have recommended progress monitoring as a tool in SUD treatment (Helsedirektoratet, , 2016), and this principle has been implemented and researched to some extent within residential treatment units (Brorson et al., 2019; Pasareanu et al., 2015; Vederhus et al., 2016b). However, as treatment adherence may be more difficult in outpatient vs residential settings, monitoring may be even more relevant and important when the patient resides outside of the controlled environment of a residential treatment setting (McLellan et al., 2005). To examine systematic progress monitoring efforts in outpatient settings would be an interesting topic for further research.

The overall improvement found at the 5-month follow-up in this study suggests that many patients experienced a slow but steady recovery trajectory during their outpatient treatment course. When comparing these results with those of previous reports from this randomized controlled trial, we cannot point to a specific methodology to explain the improvement, and time in treatment emerges as one of several plausible success factors. This implication is consistent with literature emphasizing the individual's capacity for self-change and the caregiver's role as facilitator and guide in this recovery process (Sobell & Sobell, 2000). It is important to bear in mind that most patients in this study had experienced 10 years or more with SUD; thus, we should expect the need for a long treatment duration to achieve change and stability.

4.1. *Methodological considerations*

One strength of the study was that the questionnaires were mainly administered by one test technician throughout the study period, which ensured a uniform data collection approach with similar information given to all participants. This also reduced social desirability concerns, because the participants did not report directly to their primary therapist or the study coordinator (Østergård et al., 2020). However, if the instruments were to be used as part of a continuous progress monitoring approach, the feedback forms should be discussed and evaluated jointly and regularly by the patient and the therapist to secure that the feedback is consistently implemented throughout the treatment course.

This study relied solely on patient self-report measures, without objective criteria such as biological data to confirm or reinforce the findings. Since the data stemmed from a previously conducted study of a particular intervention method, the results may have limited generalizablility to a similar population. Moreover, because of the non-controlled design, one cannot rule out that those lost to follow-up may have been worse off than those who were reached. Thus, the present finding may be a "best estimate" of clinical change in the group as a whole. However, an attrition analysis indicated that those lost to follow-up did not differ substantially at T0 from those reached at follow-up, indicating no substantial selection bias.

5. Conclusions

Patients with SUD reported an improved experience of overall functioning after 5 months of specialized interdisciplinary outpatient treatment. The multi-dimensional outcome measures reported here can serve as examples of brief monitoring tools for during-treatment evaluation in the SUD field, which can be useful in decision-making to individualize treatment and to track evidence of therapeutic benefit in the recovery process. Future research may further investigate how these tools may be efficiently implemented clinically in order to measure, and ultimately enhance, the long-term effects of outpatient treatment in Norway and beyond.

Ethics approval and consent to participate

All patients signed an informed consent-to-participate form. The

study was performed in accordance with the Declaration of Helsinki and was approved by The Regional Committee for Medical and Health Research Ethics in the South-East Health Region (ref. no. 2017/746).

Availability of data and materials

An anonymized dataset used during the current study is available from the corresponding author on reasonable request. A full, anonymized dataset will be transferred to the research depository of the Norwegian Agency for Shared Services in Education and Research 5 years after project completion (31.12.2027).

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Authors' contributions

KBG and JKV designed the study and performed and interpreted the analyses. KBG drafted the manuscript. All authors were involved in critically revising the manuscript for important intellectual content. All authors have read and agreed to the published version of the manuscript.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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