ORIGINAL RESEARCH

Female Patients Show a Larger Reduction in Suicidal Ideation in Inpatient Addiction Treatment Than Male Patients: Results of a Single-Center Observational Study

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Background: Substance use disorders (SUD) are prevalent disorders worldwide. Among other associated health problems, patients with SUD are at an increased risk of dying of suicide, with females displaying an even higher risk than males. Therefore, the aim of this study was to conduct a gender-sensitive evaluation of changes in suicidal ideation during multimodal inpatient treatment at a hospital facility specialized in treating addiction.

Methods: A total of 694 patients (68.2% male) completed routine assessment including suicidal ideation, abstinence confidence, impulsivity, emotion regulation, self-efficacy and autonomy and joy both before (T1) and at the end (T2) of treatment. Mean changes were evaluated with repeated measures MANOVAs.

Results: Before treatment, a total of n=127 (18.3%) of the respondents reported suicidal ideation, which was reduced to n=72 (10.4%) by the end of treatment. Among female patients, the change in reported suicidal ideation compared from T1 to T2 (21.7% vs 7.7%) was significantly higher than among male patients (T1: 16.7%%, T2: 11.6%; p=0.040). Generally, females reported worse symptoms scores and slightly higher numbers of suicidal thoughts at baseline (effect sizes ranging from η^2=.008 – 0.044). While both genders significantly profited from the treatment, female patients generally showed larger improvements than male.

Discussion: Our study underscores the beneficial effect of addiction-specialized inpatient treatment on suicidal ideation. Additionally, we found a substantial gender effect: while female patients generally were more distressed before treatment, they also reported higher symptom reduction during the treatment. This result highlights the need to perform more gender-sensitive research and develop more gender-sensitive treatment programs.

Keywords: addiction, inpatient therapy, alcohol, drugs, gender medicine

Introduction

With an estimated 3.8% of all global deaths and 4.6% of global DALYs (disability-adjusted life-years), the health impact of harmful alcohol use is substantial.[1] In Austria, 5% of the population over the age of 15 is addicted to alcohol, and a further 12% consume alcohol to the extent that is harmful to health.[2] However, substance use disorders (SUD) are usually only the tip of the iceberg. Beneath the surface, numerous comorbid disorders such as anxiety disorders,[3] personality disorders,[4,5] trauma

sequelae,[6] externalizing disorders[7,8] and affective disorders[9,10] can be found. The prevalence rates of comorbid disorders in dependence disorders vary considerably, with affective disorders being the most common.[9,11–13]

Problematic drinking as well as drug use are considered to be significant predictors of suicidal ideation[14] and suicidal behavior, based on the results of many studies.[15–17] Wilcox, Conner and Caine[18] showed that the suicide rate of individuals struggling with alcohol addiction could be ten times higher (and, for other drugs, even up to fourteen times higher) than the rate seen for the general population. Psychoactive substances such as alcohol strongly reduce inhibitions when taken in high doses by dampening inhibitory pathways.[19] At the same time, risky behavior increases when taking such substances, which also increases the probability of suicidal acts,[20] which is partially explained by neurobiological links between suicide and substance use disorders (SUD).[17]

In addition, researchers have also identified psychological factors that facilitate the risk of suicidal behavior, including impulsiveness and aggression alone or in addition to the presence of psychiatric comorbid disorders.[21–23] These factors are strongly expressed in addiction patients with personality disorders, and especially alcoholics with B-cluster disorders show an increased vulnerability to suicidal behavior[24] (for an overview:[25]). As (abstinence) self-efficacy and (abstinence) confidence are considered to be important influencing factors with regard to staying sober after treatment,[26,27] one study indicated that low self-efficacy is related to suicidal ideation in a sample of patients with addictive disorders.[28] Additionally, researchers have observed connections between (mal)adaptive emotion regulation and suicidal ideation, suggesting that low abilities to regulate emotions are linked to suicidal behavior in patients with SUDs.[29] As individuals seeking addiction treatment often experience a variety of predisposing and precipitating risk factors, such as relationship problems, financial and career concerns, and advanced health problems, certain sociodemographic factors are associated with suicidal ideation. Risk factors in patients with SUD include being female, having a low socioeconomic status, being single and being unemployed.[21,30–32] Females with an alcohol use disorder have been found to have a two-fold risk for death by suicide as compared to males.[33]

Thus, in primary psychiatric care, special attention is given to the treatment of substance-dependent individuals for suicide prevention. On average, it takes individuals with SUD ten years from the first manifestation of alcohol-associated problems until they seek professional help in Austria.[34,35] Many patients already have a long history of suffering, and the accompanying physical and psychological problems are often already chronic. Accordingly, subjective feelings of existential threat, as well as feelings of hopelessness and helplessness, are common. These findings indicate that the increased risk of suicidal behavior among persons with substance use disorders requires a better understanding and assessment of the associated factors.

The aim of the present study was (a) to investigate the prevalence of suicidal ideation in a sample of patients with SUD, (b) to detect changes in suicidal ideation occurring during the inpatient treatment, (c) to identify factors associated with a reduction in the number of suicidal thoughts, and (d) to highlight gender differences associated with suicidal ideation in patients with SUD.

Materials and Methods
Patients and Procedure

Data from patients with various addictive disorders were collected as part of a routine assessment during an inpatient therapeutic stay in hospital facility specialized in the treatment of addiction patients (Anton Proksch Institute, Kalksburg/ Vienna) between July 2019 and February 2022. In order to partake in the treatment, patients must exhibit an absence of acute psychotic occurrences, lack notable cognitive impairments, and possess adequate proficiency in the German language to actively participate in therapy. Depending on their specific needs, all patients received a set of multi-disciplinary therapies that included medical and nursing treatment, psychological therapies, nutritional counseling and physiotherapy. The inpatient treatment was based on a resource-oriented approach of addictive disorders to reduce the suicide rate. In addition to medical and psychotherapeutic basic modules, addiction-specific intervention modules such as relapse prevention as well as modules for sports, movement, relaxation, and social and vocational (re)integration are available to patients. An additional treatment- pillar consists of the Orpheus modules[36] to support patients in (re)claiming a meaningful and joyful life. In analogy to Orpheus the eponymous hero of Greek mythology individuals struggling with addiction are intended to perceive abstinence not as deprivation but as a foundation for transformation and an opportunity

for life redesign. In Austria, the costs for the rehabilitation treatment are covered by the social insurance institutions. Patients typically continue outpatient treatment following their inpatient stay to stabilize the treatment outcome.

In addition to meeting the treatment inclusion criteria, study participants were required to (a) be aged 18 or older, (b) provide written informed consent, (c) submit complete assessment data, and (d) identify as either male or female. Exclusion criteria comprised individuals with (a) court-ordered therapy or (b) a non-binary gender identity. The data recorded for the patients were gathered by means of a systematic, standardized survey procedure at the beginning (T1; after the first week, within day 7–10 of treatment) and end (T2; within the last week) of their therapeutic stay. Data were collected electronically using a multifunctional web-based application called the Life App, which is based on the Computer-based Health Evaluation Software (CHES).[37] Participation in the survey was voluntary, so reasons for non-participation could be multifaceted (eg, motivation, cognitive impairment, early discharge, discomfort, privacy concerns, early termination of treatment). Patients signed a written informed consent before baseline assessment. The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of Sigmund Freud University (UBWCF2VXAVBDSV88362, vote on 16 December 2020).

Assessment Instruments

The *ICD-10 Symptom Rating (ISR)*[38] was used to evaluate the severity of various psychopathological symptoms. The ISR is based on the listed symptoms of ICD-10 Chapter F and comprises a total of 29 questions to assess six subscales. In this study, five subscales were used, namely, depression, compulsion, somatization and eating disorders. Higher scores indicate worse levels of psychological well-being. *Suicidal ideation* was assessed by means of a single item from the ISR supplementary scale ('I am thinking about killing myself'). Responses could be given on a five-point scale ranging from 0 (strongly disagree) to 4 (strongly agree). Higher scores indicate more severe suicidal ideation and patients with scores higher than 0 were classified as having suicidal ideation. The *Heidelberg Scales for Abstinence Confidence (HEISA)*[39] was used to assess the degree of patients' confidence in whether they can abstain from substance use in different situations. The questionnaire comprises a total of 17 items, four of which represent the four subscales of unpleasant feelings, temptations and cravings, reckless thinking and pleasant feelings. Higher scores indicate higher levels of confidence in abstaining. The assessment of the psychological trait impulsivity was conducted using the *I-8 impulsiveness scale*.[40] The scale measures four facets of impulsive behavior by using two items each: Urgency, intention, perseverance and risk behavior. High scores on the intention and perseverance scale indicate low levels of impulsiveness, while high scores on the urgency and risk behavior scale indicate high levels of impulsiveness. Emotion regulation abilities of the patients was assessed with the *Emotion Regulation Questionnaire (ERQ)*.[41] The ERQ consists of ten items to assess the habitual use of two emotion regulation strategies: Cognitive Reappraisal refers to the reinterpretation of a situation that evokes emotion to alter its meaning and change the emotional impact. Expressive Suppression refers to the attempt to hide and/or reduce ongoing emotions. The measurement of the outcome self-efficacy was tested using the *German General Self-Efficacy Scale* (in German: *Selbstwirksamkeitserwartung* or SWE).[42] The SWE consists of 10 items which are summed up to a total score with higher scores indicating higher self-efficacy beliefs. And finally, the patients feelings of autonomy and joy were measured by using the *AUFF* (in German: *Autonomie und Freude*;[43]). The AUFF consists of 12 items which are summed up to a total score with higher scores indicating higher levels of autonomy and joy.

Statistical Analysis

Demographics for the sample are presented with means and standard deviations (SD). Since it was only possible to complete the survey if all questions had been answered, no values were missing from the data set. The participation in the observational study was on a voluntary basis. The number of cases was derived from the number of all patients treated at the study center (clinical trial center: Anton Proksch Institute, Kalksburg/Vienna, Austria). Therefore, we did not estimate the sample size before carrying out this cohort study. According to Cohen,[44] in the given 2x2x2 design [men vs women as factor A and patients with (Sui+) vs without (Sui-) suicidal ideation at T1 as factor B with two time points (factor C: pre vs post) per AxB combination], four samples of 82 participants each (N=328) would be required to ensure small to medium effects at the level of $\alpha = 0.01$ with a power $(1 - \beta)$ of 0.8. With the given sample size of n = 694, a post-hoc calculation indicates a satisfactory power $(1 - \beta > 0.80)$ to detect gender differences in suicidal ideation in patients with

SUD. Differences in sociodemographic aspects of the sample as well as checks for biases were tested for significance with chi-squared tests and independent sample *t*-tests. If the Levene's test indicated homogeneity of variances, we performed Welch's tests. General linear models (GLM) were used to perform a per protocol analysis of pre-post therapy improvements via repeated measures analysis of variances (ANOVA) and multivariate ANOVAs. In addition to the *p*-values, partial eta-squared (ηp^2), Cohen's d (*d*), and phi (ϕ) were calculated as measures of effect sizes. Effect size values of $d = 0.3$, $\eta^2 = 0.01$ and $\phi = 0.1$ were considered small; $d = 0.5$, $\eta^2 = 0.06$ and $\phi = 0.3$ were medium; and $d = 0.8$, $\eta^2 = 0.14$ and $\phi = 0.5$ were large.[45] *P*-values < 0.05 (two-sided) were considered to be statistically significant and all calculation were performed with IBM SPSS 26.0.

Results

Sociodemographic and Clinical Data

Initially, data from *n* = 1295 patients were collected. Of these, *n* = 540 patients were excluded because they only completed one assessment timepoint. Further reasons for exclusion were self-reported poor German language skills (*n* = 3), a therapeutic stay due to a court order (*n* = 42), and a prematurely canceled stay (< 17 days, *n* = 7; shortest time interval for the survey recommended by hospital officials) or extended therapeutic stay (> 122 days, *n* = 9; two-times longer than recommended by hospital guidelines). The excluded patients were significantly younger than included patients (46.4 vs 49.2 years; $p < 0.001$, $d = 0.21$), reported slightly higher scores for suicidal ideations (0.37 vs 0.28; $p = 0.020$, $d = 0.12$) and more frequently reported suicidal ideation ($p(\chi^2) = 0.026$, $\varphi = 0.076$) than the included sample. However, all differences had a small effect size.

The remaining *n* = 694 (53.6%) patients were included in the analyses. The mean age was 49.2 (*SD* = 11.8) years, and 68.2% were male. Most frequent reason for therapy was problematic alcohol use (82.4%), followed by misuse of medication (6.3%), behavioral addictions (3.3%) and other forms of addictions (eg, cannabinoids, opioids; 3.3%). Approximately half of the patients had finished basic education or an apprenticeship (55.9%), and most were not living in a relationship (76.7%). The mean interval between admission to and discharge from the rehabilitation center was 57.4 (*SD* = 18.7) days. For details, see Table 1.

Prevalence and Extent of Suicidal Ideation in Inpatient Addiction Treatment

At T1, a total of *n* = 127 (18.3%) of the respondents reported suicidal ideation. At T2, the prevalence of suicidal ideation was reduced to *n* = 72 (10.4%) (ie, the number of persons with suicidal ideation was almost reduced by half). While at T1, a higher proportion of female patients, as compared to male patients, reported experiencing suicidal ideation (21.7% vs 16.7%; $\chi^2 = 2.54$, p=0.11). However, at T2, the proportion decreased among female patients in contrast to male patients (7.7% vs 11.6%; $\chi^2 = 2.51$, p=0.11). Although there was no significant difference in the proportion of suicidal thoughts between genders at either T1 or T2, the overall reduction in prevalence was significantly more pronounced among female patients than male patients ($\chi^2 = 4.20$, p=0.040; see also Figure 1).

Overall, n = 154 (22.2%) different patients reported suicidal ideation at either T1 or T2. Of these, n = 101 (65.6%) reported weaker, n = 25 (16.2%) reported consistent, and n = 28 (18.2%) reported stronger suicidal ideation when comparing T1 and T2. A Sankey diagram in Figure 2 illustrates the changes in the expressions of suicidal ideation.

Pre-Post Improvements of Patients During Hospital Treatment

Before treatment, statistically significant differences in the baseline scores of all variables except risk behavior (I8) were found when comparing patients with and without suicidal ideation (effect sizes ranging from $\eta p^2 = 0.017$ to $\eta p^2 = 0.116$, see Supplementary Material Table S1). The multivariate ANOVA revealed a statistically significant decrease in symptoms for suicidal ($p < 0.001$; $\eta p^2 = 0.719$) as well as non-suicidal patients ($p < 0.001$; $\eta p^2 = 0.495$) with large effect sizes. Based on the self-reported ratings, statistically significant improvements in patients with suicidal ideation were observed across all variables, except for risk behavior (I8 questionnaire). In patients without suicidal ideation, all scores significantly improved. Most of the scales showed higher effects for patients with than without suicidal ideation at T1, and a higher number of large effect sizes ($\eta p^2 > 0.14$) was also detected in this group. In both groups, the largest improvements were observed for

Table 1 Sociodemographic Characteristics (*n* = 694)

	Total (n=694) n (%)	Sui+ (n=127) n (%)	Sui- (n=567) n (%)	p (χ^2)	φ
Sex				0.117	0.060
Male	473 (68.2)	79 (16.7)	394 (83.3)		
Female	221 (31.8)	48 (21.7)	173 (78.3)		
Education				0.899	0.039
University degree	82 (11.8)	16 (19.5)	66 (80.5)		
Qualification for university	155 (22.3)	29 (18.7)	126 (81.3)		
Apprenticeship	240 (34.6)	40 (16.7)	200 (83.3)		
Compulsive school/polytechnic school	148 (21.3)	27 (18.2)	121 (81.8)		
Other	69 (10.0)	15 (21.7)	54 (78.3)		
Marital status				0.203	0.069
Single	293 (42.3)	56 (20.1)	222 (79.9)		
Married	162 (23.3)	22 (13.6)	140 (86.4)		
Divorced/separated	239 (34.4)	46 (19.2)	193 (80.8)		
Migration background				0.934	0.014
Without	562 (81.0)	103 (18.3)	459 (81.7)		
First-generation migrants	95 (13.7)	18 (18.9)	77 (81.1)		
Second-generation migrants	37 (5.3)	6 (16.2)	31 (83.8)		
Employment status				0.009	0.116
Unemployed	328 (47.3)	62 (18.9)	266 (81.1)		
Employed	225 (32.4)	29 (12.9)	196 (87.1)		
Retired	141 (20.3)	36 (25.5)	105 (74.5)		
	M (SD)	**Range**	**p**	**d**	
Age	49.15 (11.77)	19–80			
Sui+	47.37 (13.88)	19–80	0.100[a]	0.19	
Sui-	49.55 (11.21)	19–79			
Duration of the therapeutic stay (days)	57.38 (18.65)	17–122			
Sui+	61.69 (18.63)	17–121	0.004	0.29	
Sui-	56.42 (18.54)	19–122			
Number of F-diagnoses	3.69 (2.50)	1–17			
Sui+	4.20 (2.47)	1–17	0.011	0.25	
Sui-	3.57 (2.49)	1–12			

Note. Effect size is considered small for d = 0.3/φ = 0.1, medium for d = 0.5/φ = 0.3 and large for d = 0.8/φ = 0.5; sui+ = patients with suicidal ideation at T1, sui- = patients without suicidal ideation at T1;
Abbreviations: M, mean; SD, standard deviation.

depression (sui+: ηp² = 0.580, sui-: ηp² = 0.435), autonomy and joy (sui+: ηp² = 0.560, sui-: ηp² = 0.314), and anxiety (sui+: ηp² = 0.473, sui-: ηp² = 0.208). Table 2 provides an overview of the main results. By the means of a repeated measures ANOVA, we also determined an overall significant interaction effect between time and suicidal ideation (*p* < 0.001, ηp² = 0.080). More precisely, ten out of the seventeen investigated scales indicated significant interactions. The highest, but still small, effect sizes were found for depression (ηp² = 0.035), anxiety (ηp² = 0.035), and autonomy and joy (ηp² = 0.032). For a detailed illustration of all interactions, see Supplementary Material Table S1.

Gender-Dependent Pre-Post Improvements

Before treatment, statistically significant differences in the baseline scores of all variables except somatization (ISR) and reappraisal (ERQ) were found when comparing male and female patients (effect sizes ranging from ηp² = 0.008 to ηp² = 0.044, see Supplementary Material Table S2). On the one hand, male patients reported higher confidence in abstaining,
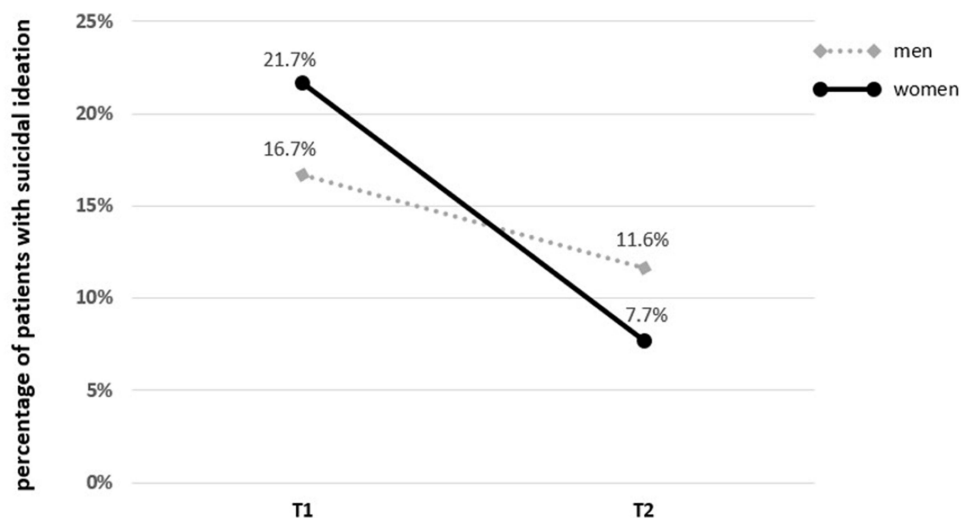
Figure 1 Percentage of patients reporting suicidal ideation before (**T1**) and at the end of treatment (**T2**), separated by gender. Definition of suicidal ideation refers to the ISR-item "In the last two weeks, I thought about killing myself" with answers ranging between 0 (strongly disagree) – 4 (strongly agree). Scores higher than 0 indicated suicidal ideation.
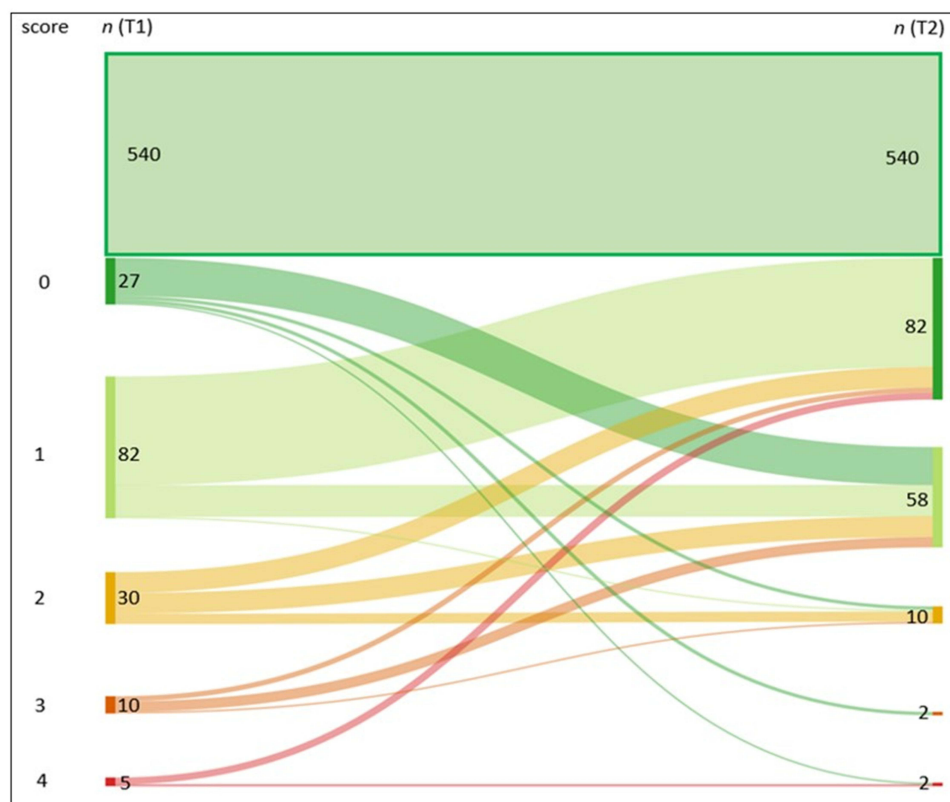

Figure 2 Sankey flow diagram of suicidal thought scores before (**T1**) and at the end of treatment (**T2**). The top green flow describes *n* = 540 patients that did not report suicidal ideation at **T1** or **T2**. The score refers to the question "In the last two weeks, I thought about killing myself" with possible answers ranging from 0 (strongly disagree) to 4 (strongly agree).

better emotion regulation, more feelings of autonomy and joy, higher self-efficacy, lower depression, anxiety and compulsion, as well as less urgent feelings of impulsiveness and greater intentions to persevere. Females, on the other hand, reported less risky behaviors in terms of impulsiveness.

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Table 2 Pre-Post Treatment Effects of Patients with and without Suicidal Ideation ($n = 694$), Sorted by Effect Size

Mean difference T2 - T1 (sui+)					Mean difference T2 - T1 (sui-)				
Scale	M	SD	p	ηp^2	Scale	M	SD	p	ηp^2
ISR_depression[a]	−1.24	1.06	***	0.580	ISR_depression[a]	−0.78	0.89	***	0.435
Autonomy and joy[b]	22.57	20.07	***	0.560	Autonomy and joy[a]	13.15	19.46	***	0.314
ISR_anxiety[a]	−0.84	0.89	***	0.473	ISR_anxiety[a]	−0.42	0.83	***	0.208
ERQ_reappraisal[b]	0.84	1.25	***	0.315	HEISA_unpleasent feelings[b]	11.87	24.82	***	0.186
ISR_compulsion[a]	−0.62	0.94	***	0.306	Perceived self-efficacy[b]	1.95	4.40	***	0.164
I8_urgency[a]	−0.62	0.95	***	0.299	ERQ_reappraisal[b]	0.52	1.19	***	0.160
ISR_somatization[a]	−0.50	0.81	***	0.276	I8_urgency[a]	−0.43	0.98	***	0.160
Perceived self-efficacy[b]	3.05	5.38	***	0.244					
HEISA_unpleasant feelings[b]	14.41	26.14	***	0.234					
HEISA_pleasant feelings[b]	11.61	23.20	***	0.202					
HEISA_temptations and cravings[b]	12.52	25.73	***	0.193					
I8_premediation[b]	0.34	0.73	***	0.181					
I8_perserverance[b]	0.39	0.90	***	0.157					

Note. ***$p < 0.001$; effect size is considered small for $\eta p2 > 0.01$, medium for $\eta p2 > 0.06$ and large for $\eta p2 > 0.14$, only effect sizes $\eta p^2 > 0.14$ are included; sui+ = patients with suicidal ideation at T1, sui- = patients without suicidal ideation at T1; M=mean score; SD = standard deviation; a = significantly higher scores for sui+ than sui- at baseline T1. b = significantly higher scores for sui- than sui+ at baseline T1; between-subject-scores sui+: F (17, 110) = 16.542, $p < 0.001$, $\eta p^2 = 0.719$; between-subject-scores sui-: F(17, 550) = 31.734, $p < 0.001$, $\eta p^2 = 0.495$; for a detailed overview, see Supplementary Material Table S1.

No significant difference was observed in the ratings of the suicidal ideation when comparing male and female patients prior to the treatment ($p = 0.288$). Multivariate ANOVA revealed a statistically significant main effect of time for male ($p < 0.001$; $\eta p^2 = 0.485$) as well as female ($p < 0.001$; $\eta p^2 = 0.624$) patients between the two measurements. Based on the self-reported ratings, significant improvements for all variables, except for suppression (ERQ), were observed for female patients. Males reported significant changes for all variables. Generally, female patients indicated higher improvements and reported large effect sizes ($\eta p^2 > 0.14$) more often than male patients. The highest effects for both groups were found in terms of depression (ISR; female: $\eta p^2 = 0.539$, male: $\eta p^2 = 0.423$), autonomy and joy (AUFF; female: $\eta p^2 = 0.493$, male: $\eta p^2 = 0.296$), and anxiety (ISR; female: $\eta p^2 = 0.352$, male: $\eta p^2 = 0.212$) ratings (see Table 3).

Table 3 Pre-Post Treatment Effects for Female and Male Patients ($n = 694$), Sorted by Effect Size

Mean difference T2 - T1 (female)					Mean difference T2 - T1 (male)				
Scale	M	SD	p	ηp^2	Scale	M	SD	p	ηp^2
ISR_depression[a]	−1.08	1.00	***	0.539	ISR_depression[a]	−0.77	0.90	***	0.423
Autonomy and joy[b]	20.69	21.01	***	0.493	autonomy and joy[b]	12.15	18.77	***	0.296
ISR_anxiety[a]	−0.64	0.87	***	0.352	ISR_anxiety[a]	−0.43	0.83	***	0.212
HEISA_unpleasant feelings[b]	16.97	26.68	***	0.289	ERQ_reappraisal	0.51	1.15	***	0.163
ERQ_reappraisal	0.73	1.31	***	0.237	I8_urgency[a]	−0.41	0.93	***	0.160
HEISA_temptations and cravings[b]	15.20	27.31	***	0.237	perceived self-efficacy[b]	1.83	4.24	***	0.157
I8_urgency[a]	−0.58	1.05	***	0.233	HEISA_unpleasant feelings[b]	6.42	19.20	***	0.152
Perceived self-efficacy[b]	2.84	5.28	***	0.226					
HEISA_pleasant feelings[b]	12.22	23.16	***	0.218					
ISR_compulsion[a]	−0.43	0.84	***	0.207					
ISR_suicidal ideation ($n = 57$)	0.82	1.31	***	0.287	ISR_suicidal ideation ($n = 97$)	0.55	1.21	***	0.171
ISR_suicidal ideation ($n = 694$)	−0.21	0.75	***	0.074	ISR_suicidal ideation ($n = 694$)	−0.11	0.59	***	0.035

Note. ***$p < 0.001$; effect size is considered small for $\eta p2 > 0.01$, medium for $\eta p2 > 0.06$ and large for $\eta p2 > 0.14$, only effect sizes $\eta p^2 > 0.14$ (except for suicidal ideation) are included. n = 67 and n = 97 of the ISR_suicidal ideation variable refers to the improvements of patients, who reported suicidal ideation at T1; M=mean score; SD = standard deviation; a = T1 significantly higher scores for female than male patients at baseline T1; b = significantly higher scores for male than female patients at baseline; between-subject scores for female patients: F(17, 204) = 19.906, $p < 0.001$, $\eta p^2 = 0.624$; between-subject scores for male patients: F(17, 456) = 25.248, $p < 0.001$, $\eta p^2 = 0.485$ for a detailed overview, see Supplementary Material Table S2.

As for suicidal ideation, female patients showed improvements with moderate ($\eta p^2 = 0.074$) and male patients with small effect sizes ($\eta p^2 = 0.035$). Due to the high number of patients without suicidal ideation at T1, gender-specific analyses were repeated in patients with suicidal ideation at T1. While we found large significant improvements with high effect sizes for both genders, female patients ($\eta p^2 = 0.287$) reported higher improvements than male patients ($\eta p^2 = 0.171$).

Again, by conducting a repeated measures ANOVA, a significant overall interaction effect for time and gender was observed ($p < 0.001$; $\eta p^2 = 0.062$). In ten out of seventeen scales, significant time*gender interactions were observed. The largest effect of gender on improvement during the treatment was found for autonomy and joy (AUFF; $\eta p^2 = 0.031$), temptations and cravings (HEISA; $\eta p^2 = 0.023$), and unpleasant feelings (HEISA; $\eta p^2 = 0.021$). For a detailed overview, see Supplementary Material Table S2.

Discussion

The aim of this study was to investigate the prevalence of suicidal ideation in a sample of patients with SUD as well as to detect changes in suicidal ideation occurring during the inpatient treatment, identifying factors associated with a reduction in the number of suicidal thoughts, and highlighting gender differences associated with suicidal ideation in patients with SUD. The results of the study underline the necessity of performing a detailed anamnesis of current suicidal ideation in inpatients undergoing SUD treatment and provides initial findings on the effectiveness of a resource-oriented treatment of the addictive disorder using the example of the "Orpheus Model"[36] to reduce the suicide rate.

In our sample, a substantial proportion of patients (~18%) reported suicidal ideation. This prevalence agrees with other results reported for inpatients,[46] but is higher than those reported for outpatient samples with SUD.[47] Before treatment, female patients reported a higher prevalence of suicidal ideation than male patients (22% vs 17%), although this difference was not statistically significant. Studies of the general population have shown that female participants tend to report suicidal ideation more often than male.[48] Some studies found no significant gender difference in this regard in patient samples treated for SUD,[47,49,50] while others supported the hypothesis that females show higher rates of suicidal ideation or behavior.[30,32] However, most of these studies investigated suicidal ideation differently (eg, in terms of lifetime suicidal ideation) and, given the increased risk of dying from suicide among females patients with alcohol use disorders as compared to among male patients,[33] it seems fair to assume that a heightened risk for suicidal ideation exists among females with SUDs. Some researchers have hypothesized that, in females with an alcohol use disorder, the risk of dying from suicide may be increased by a heightened susceptibility to the effects of alcohol,[51,52] an accelerated progression toward dependence (ie, "telescoping effect")[53], and earlier onset health issues and psychosocial complications caused by alcohol.[54] Female patients in our sample, however, not only reported having more suicidal thoughts before treatment, but also fewer suicidal thoughts at the end of treatment (8% vs 12%). This indicates that females may benefit more from inpatient treatment in terms of a reduction in suicidal ideation than men. This finding agrees with those from previous studies, which found that psychosocial interventions for suicidal ideation and behavior are more effective in females than males.[55] However, the latter authors also critically noted that only 18% of RCTs reported gender differences for psychosocial interventions to reduce the risk of suicide, thus highlighting the fact that this is still a relatively neglected area of research and clinical practice.

At baseline, a clear pattern of gender differences could be observed: While female patients reported higher levels of anxiety, depression and compulsion, male patients reported higher levels of confidence in abstaining, more feelings of autonomy and joy, and higher self-efficacy. In the past, other authors have clearly pointed out that females are more at risk for depressive[56] and anxiety disorders than males.[57] In line with previous research,[41,58] male patients in our study tended to suppress emotion more actively than female patients as a strategy for regulating their emotions. While emotion suppression is often associated with dysfunctional coping and negative long-term outcomes,[59] some studies indicated a potential male advantage associated with the short-term regulation of negative emotions by expressive suppression.[60]

Overall, patients largely benefitted from the inpatient treatment in terms of a reduction in overall symptoms. The largest improvements were found for depressive symptoms, anxiety, as well as a substantial increase in subjective autonomy and joy. While both males and females profited from the therapy, female patients generally showed larger effect sizes than male patients. This finding agrees with those of previous studies, which reported better treatment success[61] as well as greater reductions in post-treatment substance use in female participants.[62]

However, several limitations of the study have to be considered. First, a floor effect for suicidal ideation was observed, which indicated that suicidal ideation might not have been assessed perfectly. Given the substantial gender effects we observed in our study, we conclude that gender-specific assessment tools are needed. Another limitation is the high dropout rate seen in our sample. In addition, it is not clear whether some patients reported higher levels of suicidal ideation at baseline due to the withdrawal symptoms they experienced in the first week of treatment. In our sample, no exact data on the use of agonist treatment is available. However, the data for patients at T1 are collected 7–10 days after admission and thus for most patients with an alcohol use disorder – which constitutes the majority of our sample – alcohol withdrawal and its drug treatment is completed by this time. Additionally, since some patients are admitted early or do not require withdrawal (eg, in case of behavioral addictions), it can be assumed that the majority of individuals were not under the influence of withdrawal medications. Also, participation in the study was voluntary; therefore, individuals experiencing severe withdrawal symptoms and having limited cognitive resources would likely face challenges in completing the questionnaire and would therefore not have participated. It has to be assumed that the change of environment partially causes the observed improvements during treatment and thus may be an important mechanism of change in itself. As treatment motivation is already a part of therapeutic work in patients with substance use disorders, the willingness for inpatient admission can be considered as part of treatment success. In the case of substance use disorders, inpatient treatment is even more stigmatized and laden with shame compared to other psychiatric conditions, which is why the change in setting, according to the bio-psycho-social treatment concept, represents a crucial step in the treatment process.

The presence of the psychologist during the assessment procedures may have increased the social desirability bias. To reduce this bias, the psychologists have been instructed to stay in the background and only interact with the patient if there are problems during the assessment. One notable limitation of this study is the presence of self-selection bias. Participants were not randomly assigned to groups; rather, they voluntarily chose to participate. This self-selection introduces the possibility that individuals with specific characteristics or motivations may be overrepresented in the study sample and thus the findings may not be fully generalizable to the broader population. Future research with randomized controlled designs or additional statistical controls could help mitigate the impact of self-selection bias on the interpretation of study outcomes. In addition, long-term follow-up is necessary to evaluate the sustainability of the improvements observed in this study.

Conclusion

Our study underscores the beneficial effect of addiction-specialized inpatient treatment on suicidal ideation, as well as psychopathologies and protective factors such as self-efficacy and positive feelings of autonomy and joy. The findings show that addiction treatment has the potential to lower the suicidal risk and reduce the risk of other comorbidities, supporting protective factors such as emotion regulation, impulsiveness and self-efficacy. Targeting and encouraging positive aspects and focusing on healthy aspects of the patients psyche during inpatient therapy should be considered as important to reduce psychopathologies such as depression or anxiety.

In addition, we found substantial gender differences both in terms of psychological distress at baseline as well as the therapeutic outcome: While female patients generally were more distressed at the beginning of the inpatient therapy they also reported a larger improvement of distress during the therapy program. This result highlights the need to perform more gender-sensitive research and develop more gender-sensitive treatment programs.

Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of Sigmund Freud University, Vienna (UBWCF2VXAVBDSV88362, vote on 16 December 2020).

Data Sharing Statement

The data sets analyzed in this manuscript are not publicly available due to ethical and legal restrictions (data contain potentially identifying and sensitive patient information). If not already reported within this work, the authors may provide descriptive data on individual medical indicators for admission and discharge or the expected change due to

inpatient health care for various groups and diagnoses. Requests for access to anonymized data sets should be directed to the corresponding author Vincent Grote (Vincent.grote@rehabilitation.lbg.ac.at).

Informed Consent Statement

Acknowledgments

Author Contributions

Disclosure

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