

PREDICTING PARTICIPATION IN AND SUCCESS OF A CONCURRENT SMOKING CESSATION PROGRAM DURING INPATIENT TREATMENT FOR ALCOHOL DEPENDENCE

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SUMMARY

Background: Predicting participation in and success of smoking cessation programs in alcohol dependent patients has yielded heterogeneous results. Moreover, these findings have rarely been based on prospective studies from clinical routine settings. Identifying predictors in prospective studies could help to tailor interventions that increase participation and success rates of smoking cessation therapies for these patients at a high risk for alcohol- and smoking-related morbidities and mortalities.

Subjects and methods: During inpatient alcohol dependence treatment, 99 nicotine dependent patients were recruited. 73 patients chose to participate in a voluntary smoking cessation program. Interviews and questionnaires were used at baseline and at discharge to assess a large set of variables covering smoking and alcohol related factors, general psychopathology, quality of life and personality traits. Multiple logistic regression models were calculated to predict participation in the smoking cessation program and smoking abstinence at follow-up three months after discharge.

Results: Participation in the smoking cessation program was predicted by higher stage of change, higher confidence in abstaining from smoking and lower perceived stress. Successful smoking cessation at follow-up was predicted by higher expectations of negative physical feelings due to smoking and lower expectations of temptations to smoke at baseline, and by lower number of daily smoked cigarettes at discharge.

Conclusion: Despite the small sample size, this prospective study gives a first indication of clinically relevant predictors of participation in and success of a smoking cessation program by exploring many previously reported predictors simultaneously. The findings and their implications for treatment allocation and optimization are discussed.

Key words: smoking cessation - inpatient treatment - alcohol dependence

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INTRODUCTION

Both smoking and alcohol consumption are amongst the top 10 preventable factors associated with premature death and disability adjusted life years lost (World Health Organization 2009). In alcohol dependent patients, the prevalence of nicotine dependence (75.2%, Guydish et al. 2016) is significantly higher than in the general population (12.8%, Grant et al. 2004), which translates into higher morbidity and mortality in these comorbid patients (Bandiera et al. 2015, Hurt et al. 1996). Therefore, smoking cessation treatment should be offered to all nicotine dependent alcohol misusers. Alcohol dependence treatment programs can be regarded as an opportunity to offer smoking cessation therapy (Jacques et al. 2014, Mueller et al. 2012), since alcohol dependent smokers seek

smoking cessation treatment less frequently (Fiore et al. 2008) despite existing motivation to stop smoking (Prochaska et al. 2004). Reviews (Apollonio et al. 2016, Prochaska et al. 2004, Thurgood et al. 2016) reported significantly improved abstinence rates posttreatment in patients who participated in smoking cessation programs compared to untreated controls. In previous studies, self-reported motivation to quit smoking among patients with other comorbid substance use disorders was predicted by longer periods of smoking abstinence (Martin et al. 2006), older age, non-caucasian ethnicity, shorter duration of lifetime-smoking, more previous quit attempts, fewer depressive symptoms (Joseph et al. 2004), fewer barriers to quit (e.g. aversive effects of withdrawal, (Martin et al. 2016) and higher self-efficacy (Martin et al. 2006). However, while self-reported motivation to quit is

important, observable behavior such as quit attempts and participation in a smoking cessation program are of higher clinical relevance. This was predicted by younger age, smoking related physical problems, thinking that inpatient detoxification is the best time to quit, fewer weeks of past smoking abstinence (Seidner et al. 1996), lower level of severity of nicotine dependence and higher stage of change (Heffner et al. 2007).

Several other studies investigating predictors of smoking cessation have identified a broad range of factors: lower levels of nicotine dependence severity (Burling & Burling 2003), longer alcohol abstinence (Kalman et al. 2004) and longer past smoking abstinence (Patten et al. 2001) all seemed to predict smoking cessation success. In addition, system relevant factors such as health care professionals attitudes, time and training regarding smoking cessation have been shown to impair the provision of adequate smoking cessation treatment (Sheals et al. 2016).

Not surprisingly, a previous review on predictors of readiness and ability to quit smoking in alcohol misusers found a lack of consistency among reported predictors (Heffner et al. 2007). The authors conclude that there is a need for prospective studies to investigate behavioral rather than intentional changes. When investigating treatment outcome, these authors suggest to focus on individual factors that predict smoking cessation outcomes, especially factors related to alcohol dependence. One such factor may be quality of life (Frischknecht et al. 2013) which has been shown to be predictive of cancer treatment outcome (Montazeri 2009), but has only recently been investigated as a predictor of treatment success in addiction (Picci et al. 2014).

In a recent study (Pätz et al. 2017), we evaluated a concurrent smoking cessation program which was offered during a three-week inpatient substance dependence treatment. Patients could opt to participate in the smoking cessation program which consisted of cognitive behavioral therapy and nicotine replacement therapy. We found not only a high rate of participation in the smoking cessation program (32.5% of all admitted smokers), but also a quit rate of 16.3% at a 3-month follow-up post-discharge. As expected, patients in the comparison group, who were not motivated to quit smoking and thus continued smoking, did not achieve tobacco abstinence (0%). To optimize treatment allocation, valid and strong predictors that are easily administered in a clinical routine setting are needed. In the present study, the subsample of alcohol dependent patients of Pätz et al. (2017) was reanalyzed to determine which of various psychometric predictors, including quality of life, prospectively predict both participation in a smoking cessation program that is implemented alongside routine clinical care and successful smoking cessation at a three-month follow-up. Hereby we aimed to isolate those predictors that will best explain the variance in these outcomes.

SUBJECTS AND METHODS

Study design

Dependent variables of the study were a) participation in the smoking cessation program and b) smoking abstinence at 3-month follow-up among participants of the smoking cessation program. The study was approved by the ethics committee of the Medical Faculty Mannheim, Heidelberg University, Germany (AZ: 2011-220N-MA) and was registered in the German Clinical Trials Register (www.drks.de; DRKS00003344).

Sample

Patients (N=99) that fulfilled criteria for both alcohol and nicotine dependence according to ICD-10 were recruited from an inpatient alcohol dependence treatment program at the (institution excluded to ensure double blind review). All participants provided written informed consent. Recruitment took place within the first four days of admission to the ward. Patients were either informed in person by the responsible physician on the day of admission or during a single group session regarding smoking and related health consequences that was obligatory to all admitted smoking patients. The patients were given an information leaflet on the study and written informed consent was obtained if participants were willing to participate in the study. Patients could opt between participation in the additional smoking cessation program or continuation of alcohol dependence treatment without additional smoking cessation program. The latter group only provided information on all respective measures at the respective time-points as the treatment group.

The three week alcohol dependence treatment program has been shown to result in alcohol abstinence rates of 20% at 12-month follow-up (Mann et al. 2006). Additional to detoxification from alcohol, this treatment consists of several group therapy sessions following evidence-based psychotherapeutic interventions for alcohol dependence treatment, such as progressive muscle relaxation, social competence training, motivational strategies, occupational therapy, mindfulness and initiation of self-help group attendance.

Exclusion criteria were a treatment duration of less than two weeks and limited language or cognitive skills that prevented written informed consent and completion of questionnaires. Early after admission, patients were asked to participate in the study. Patients could opt to enroll in the additional smoking cessation treatment (participants, N=73) or not (comparison group, N=26). Patients in both groups were assessed at three time points with structured interviews and self-assessment questionnaires: at baseline after study inclusion within the first week of admission, at discharge after three

weeks of alcohol dependence treatment, and at follow-up 3 months after discharge. In total about 550 questions had to be answered by each patient at baseline, 459 of them were self report items of the questionnaires reported below. Author TP assessed the additional information by interview and handed the questionnaires to the patients and if necessary helped with filling out. Patients time needed for the full assessment of baseline, discharge and follow-up data summed up to approximately 4 hours.

Participants in the smoking cessation group could choose between the different evidence-based smoking cessation treatment options, such as group therapy (once a week for 60 minutes, applied by certified smoking cessation trainers) and/or nicotine replacement therapy (patches, chewing gums, inhalers were provided) and varenicline. Patients were advised to combine pharmacological and psychotherapeutic interventions according to the guidelines for nicotine dependence treatment (Batra et al. 2015). In addition, the nurses and doctors of the ward were available for individual counseling on all aspects of smoking cessation as requested. Cognitive behavioral group therapy (CBT) sessions, included stimulus control strategies, positive and negative reinforcement techniques, relapse prevention, and motivational interventions. Of the intervention group 71% chose a combination of nicotine replacement therapy and CBT sessions and 15% chose nicotine replacement therapy only (for details see (reference excluded to ensure double blind review).

Measures

Baseline variables

A baseline interview collected information on socio-economic factors (age, sex, education), as well as on variables of both alcohol and nicotine consumption: age at onset of consumption, current daily consumption, number of previous quit attempts, ICD-10 criteria for substance dependence. Questionnaires covered additional nicotine and alcohol related factors, general psychopathology, quality of life (QoL) and personality traits.

Nicotine related questionnaires: Nicotine dependence severity and cigarette craving were evaluated using the Fagerström Test for nicotine dependence (FTND, Bleich et al. 2002) and the Questionnaire for Smoking Urges (QSU, Müller et al. 2001), respectively. Self-efficacy to abstain from smoking was measured using the Self Efficacy für Raucher - German (SER-G, Schumann et al. 2003). In the SER-G, participants rate both their temptation and their confidence to resist smoking. To assess the stage of change in motivation to quit smoking, we used the readiness-to-change-questionnaire (RCQ, Hannover et al. 2001). This questionnaire assesses the three stages 'precontemplation', 'contemplation' and 'action'. In the initial version of this questionnaire the

fourth stage of 'maintenance' was also tried to assess, however the reliability of this stage was poor in alcohol dependent patients (Heather & Rollnick 1993), so it was excluded in the version we used. The Smoking Consequences Questionnaire for Adults SCQ-A (Copeland et al. 1995) asks the participant to rate their beliefs about possible consequences of smoking in nine subscales: 'health risk', 'negative social impression', 'negative physical feelings', 'taste/sensorimotor manipulation', 'boredom reduction', 'stimulation/state enhancement', 'negative affect reduction', 'social facilitation' and 'weight control'.

Alcohol related questionnaires: Alcohol dependence severity and alcohol craving were assessed using the Alcohol Dependence Scale (ADS, Skinner & Horn 1984) and the Obsessive-Compulsive-Drinking-Scale (OCDS, Nakovics et al. 2008), respectively. The Alcohol Abstinence Self-Efficacy Scale (AASE, Bott et al. 2003) was used to assess both temptation to drink and confidence to resist drinking.

Questionnaires related to general psychopathology and quality of life: The Beck Depression Inventory (BDI-II) was used to assess depressiveness and the Brief Symptom Inventory (BSI, Franke 2000) was used to assess the general psychological symptom status by using the Global Severity Index (GSI). Perception of distress was assessed with the Perceived Stress Scale (PSS, Cohen et al. 1983). The WHOQoL-BREF (Conrad et al. 2009) was used to determine subjective ratings in four domains of quality of life (physical health, psychological, social, environmental) and a global quality of life score.

Personality related instruments: Trait anxiety was assessed using the State-Trait-Anxiety Inventory (STAI, Laux et al. 1981). Impulsiveness was assessed with the Barret Impulsiveness Scale (BIS, Preuß et al. 2003). 'Harm Avoidance' (HA), 'Novelty seeking' (NS) and 'Reward dependence' (RD) traits were estimated from 99 items of the Temperament and Characteristics Inventory (TCI, Cloninger et al. 1994).

Assessment at Discharge after inpatient treatment

Prior to discharge from the clinic, the following information was reassessed: number of cigarettes smoked per day, RCQ, OCDS, BSI, and WHOQoL-BREF.

Follow-up assessment

Follow-up information was assessed by telephone interview 3 months after discharge from the inpatient treatment unit. Response rate of participants of the smoking cessation program was 91.8 %. Participants were asked about their current smoking status "how many cigarettes did you smoke per day during the past seven days?" If patients reported zero cigarettes during the past seven days, they were classified as "smoking abstinent".

Statistics

First we analyzed the complete alcohol dependent sample at baseline comparing subsequent participants of the smoking cessation program to those in the comparison group, who did not participate in this adjuvant smoking cessation program, using t-tests, Mann-Whitney-U tests and chi-square tests. In keeping with the exploratory nature of the study, we did not apply correction methods for multiple testing and, therefore, regard effects as significant at an alpha level of 5% and as trend level significant at alpha below 10%. When multiple variables with highly overlapping content showed significance or trend level significance, we checked for the effect size and only included the variable with the largest effect size in the multiple binary regression analysis.

Following this analysis, all variables that showed trend level significant differences ($p < 0.10$) were included in a multiple binary logistic regression to predict participation using the stepwise forward Wald method.

This analysis strategy was repeated for the subgroup of participants of the smoking cessation program in order to identify predictors of smoking cessation success at follow-up. Therefore, comparison and prediction analyses were performed using smoking abstinence at 3-month follow-up (yes vs. no) as the dependent variable. In order to test variables that were assessed at discharge, a separate logistic regression analysis was performed.

All analyses were performed using SPSS Version 21 (IBM 2013).

RESULTS

Baseline group differences and predictors of participation in smoking cessation program

Statistical analysis of baseline variables at study inclusion between participants of the smoking cessation program and the comparison group which declined smoking cessation intervention are shown in supplementary table S1. Trend level or significant differences were found in the following variables (see table 1): education, readiness to change smoking, expectations of negative social impressions due to smoking, expectations of negative physical feelings due to smoking, expectations of pleasurable taste and sensorimotor manipulations due to smoking, confidence in abstaining from smoking, onset and duration of alcohol dependency, craving for alcohol, expectations of temptation to drink alcohol, confidence in abstaining from alcohol, depressiveness, general symptomatology, perceived stress, social domain of the quality of life instrument, mental domain of the

quality of life instrument, environmental domain of the quality of life instrument, trait anxiety and harm avoidance.

Using these variables, multiple binary logistic regression resulted in a model that identified stage of change (RCQ, Odds ratio (OR): 7.88, 95% confidence interval (CI): 1.87 - 35.82, $p = 0.008$), confidence in abstaining from smoking (SER-G Confidence, OR: 1.13, CI: 1.01 - 1.27, $p = 0.037$) and perceived stress (PSS, OR: 0.87, CI: 0.78 - 0.97, $p = 0.009$) as predictors of participation in the smoking cessation program. The model classified 79.7% of the cases correctly and explained 40% of the variability (Nagelkerkes $R^2 = 0.40$). This indicates that the odds of participation increase almost eight fold with each higher score in the stage of change (RCQ), according to the transtheoretical model. A one point higher response in the confidence to abstain from smoking in the SER-G confidence subscale increased the odds for participation by 13%. The odds of participation increased by 15% with each point lower in the rating of perceived stress measured by the PSS ($1/OR = 1/0.87 = 1.15$).

Baseline group differences and predictors of smoking cessation at 3-month follow-up.

Differences in baseline variables that reached at least trend level significance between smoking abstinent patients at follow-up who participated in the smoking cessation program and those participants who reported any smoking at 3-month follow-up are found in the expectation of negative social impressions due to smoking, expectation of health risks due to smoking, negative physical feelings due to smoking temptation to smoke, confidence in abstaining from alcohol, mental domain of the quality of life instrument, environmental domain of the quality of life instrument, trait anxiety and reward dependency (see table 2; for all comparisons see supplementary table S2).

Again, we included all variables that differed significantly or at least showed trend level differences into a multiple binary logistic regression analysis. The resulting model identified expectation of negative physical feelings due to smoking (SCQA, OR: 1.37, CI: 1.05 - 1.80, $p = 0.02$) and expectancy of temptation to smoke (SER-G, OR: 0.81, CI: 0.67 - 0.99, $p = 0.04$) as predictors of smoking abstinence at 3-month follow-up. This model classified 90.2% of the cases correctly and explained 50% of the variability (Nagelkerkes $R^2 = 0.50$). This indicates that a one point increase in SCQA subscale is associated with a 37% increase in odds for smoking abstinence and that the odds for smoking abstinence increase by 23% with each point less in temptation expectancy ratings ($1/0.81 = 1.23$).

Table 1. Baseline differences between subsequent participants of an adjuvant smoking cessation treatment and a comparison group without smoking cessation treatment and prediction of participation

	Participants of smoking cessation program (N=73, Mean, SD)	Comparison Group (N=26)	Group comparison p-value	Prediction of participation by binary logistic regression Odds ratio	p-value	Prediction of participation by multiple logistic regression (I=Yes) CI (95%)
Socio-demographic factors	Education (0=no education, 5=A-level)	3.7 (0.78)	0.07		n.s.	
Smoking related factors	Stage of change RCQ	2.2 (0.5)	0.013	7.88	0.008	1.87-35.82
	SCQA-negative social impression	11.6 (6.8)	0.06		n.s.	
	SCQA negative physical feelings	11.7 (6.7)	0.04		n.s.	
	SCQA Taste-sensorimotor manipulation	15.8 (7.3)	0.04		n.s.	
	SER-G Confidence	19.8 (7.3)	0.01	1.13		0.04
Alcohol related factors	Age at onset alcohol dependence	31.7 (10.7)	0.02		n.s.	
	Duration of alcohol dependence	12.4 (10.2)	0.04		n.s.	
	OCDS-total	17.8 (8.1)	0.02		excl.	
	OCDS-actions	10.1 (4.5)	0.01		n.s.	
General psychopathology and well-being	Abstinence self efficacy - Temptation (AASE)	39.9 (17.4)	0.07		n.s.	
	Abstinence self efficacy - confidence (AASE)	45.7 (21.2)	0.08		n.s.	
	Depressiveness (BDI)	15.5 (10.8)	0.03		n.s.	
	Global Severity Index BSI	0.8 (0.6)	0.09		n.s.	
	Perceived Stress Scale (PSS)	21.6 (6.0)	0.008	0.87		0.78-0.97
	Mental domain (WHOQoL-BREF)	50.3 (16.9)	0.10			
	Social domain (WHOQoL-BREF)	53.2 (22.7)	0.02			n.s.
	environmental domain (WHOQoL-BREF)	63.5 (16.2)	0.07			n.s.
	Trait anxiety (STAI)	49.6 (9.5)	0.05			n.s.
	Harm avoidance (TCI)	19.3 (6.2)	0.02			n.s.

Presented are variables that showed trend level significant differences ($p < 0.10$) between groups at baseline and therefore were included in a stepwise forward logistic regression analysis; n.s. - Variable not in the equation of the multiple binary logistic regression model, but was included in the analysis; excl. - Variable was excluded due to informative overlap and lower effect size compared to another included variable; SCQA -Smoking Consequences Questionnaire for Adults; SER-G - Self-Efficacy for smokers german version; OCDS - Obsessive Compulsive Drinking Scale; AASE - Alcohol Abstinence Self-Efficacy Scale; BDI - Beck Depression Inventory; BSI - Brief Symptom Inventory; WHOQoL-BREF - World Health Organization Quality of Life-Brief instrument; STAI - State-Trait Anxiety Inventory; TCI - Temperament and Characteristics Inventory

Table 2. Baseline differences between successful participants (smoking abstinence at 3-month follow-up) and unsuccessful participants (any smoking at 3-month follow-up) of the smoking cessation program and prediction of treatment success

Smoking related factors	Smoking abstinent at 3-month follow-up (N=9)		Smoking at 3-month follow-up (N=58)		Group comparison	Prediction of treatment success (1=yes) by multiple binary logistic regression	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)		p-value	Odds ratio
SCQA-Health risk	36.0 (0.0)	33.6 (4.1)	<0.001	n.s.			
SCQA-negative social impression	15.9 (4.8)	11.3 (7.0)	0.08	n.s.			
SCQA negative physical feelings	17.6 (6.5)	10.7 (6.1)	0.005	1.37			1.05-1.80
SER-G-Temptation	31.6 (6.7)	36.9 (5.6)	0.02	0.81			0.045
Alcohol related factors	Abstinence self efficacy – confidence (AASE)	62.6 (14.7)	45.4 (20.3)	0.04	n.s.		
General psychopathology and well-being	mental domain (WHOQoL-BREF)	58.3 (10.0)	48.0 (17.8)	0.03	n.s.		
	environmental domain (WHOQoL-BREF)	75.0 (11.5)	61.5 (15.9)	0.03	n.s.		
Personality	Trait anxiety (STAI)	44.0 (7.0)	50.4 (10.0)	0.09	n.s.		
	Reward dependence (TCI)	16.9 (4.7)	14.4 (3.4)	0.07	n.s.		

Presented are variables that showed trend level significant differences ($p < 0.10$) between groups at baseline and therefore were included in a stepwise forward logistic regression analysis; n.s. - Variable not in the equation of the multiple binary logistic regression model, but was included in the analysis; SCQA -Smoking Consequences Questionnaire for Adults; SER-G - Self-Efficacy for smokers german version; AASE - Alcohol Abstinence Self-Efficacy Scale; WHOQoL-BREF - World Health Organization Quality of Life-Brief instrument; STAI - State-Trait Anxiety Inventory; TCI - Temperament and Characteristics Inventory

Table 3. Differences at discharge from inpatient treatment between successful participants (smoking abstinence at 3-month follow-up) and unsuccessful participants (any smoking at 3-month follow-up) of the smoking cessation program and prediction of treatment success

Smoking related factors	Smoking abstinent at 3-month follow-up (N=57)		Smoking at 3-month follow-up (N=58)		Group comparison	Prediction of treatment success (1=yes) by multiple binary logistic regression	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)		p-value	Odds ratio
Number of cigarettes per day	1.1 (2.3)	8.8 (7.5)	<0.001 ^a	0.60			0.03
Craving for cigarettes (QSU)	70.1 (10.0)	87.2 (20.0)	0.002	n.s.			
Physical domain (WHOQoL-BREF)	79.0 (15.0)	62.7 (20.5)	0.04	n.s.			
environmental domain (WHOQoL-BREF)	78.5 (15.1)	66.6 (17.1)	0.07	1.07			0.053

Presented are variables that showed trend level significant differences ($p < 0.10$) between groups at baseline and therefore were included in a stepwise forward logistic regression analysis; ^abased on nonparametric Mann-whitney U test; n.s. - Variable not in the equation of the multiple binary logistic regression model, but was included in the analysis; QSU Questionnaire of Smoking Urges; OCDS - Obsessive Compulsive Drinking Scale; BSI - Brief Symptom Inventory; WHOQoL-BREF - World Health Organization Quality of Life-Brief instrument

Table S1. Baseline differences between participants of an adjuvant smoking cessation treatment and a comparison group without smoking cessation treatment

		Participants of smoking cessation program (N=73, Mean, SD)	Comparison Group (N=26)	Group comparison p-value	
Socio-demographic factors	Age	44.3 (10.7)	42.2 (9.2)	0.37	
	Sex	63% male	77% male	0.20	
	Education (0=no education, 5=A-level)	3.5 (0.9)	3.7 (0.78)	0.07	
Smoking related factors	Number of cigarettes per day	24.7 (10.6)	28.4 (13.7)	0.31	
	Age at beginning of smoking	16.8 (4.7)	15.08 (4.4)	0.20	
	Years of smoking	25.6 (9.9)	25.6 (9.9)	0.96	
	Pack years	29.4 (18.7)	39.6 (27.1)	0.27	
	Number of previous quit attempts	2.2 (3.5)	2.4 (7.5)	0.12	
	Tobacco dependence severity (Number of ICD criteria)	4.5 (0.8)	4.4 (1.0)	0.50	
	Fagerström Test for Nicotine dependence	6.0 (2.0)	6.7 (2.3)	0.19	
	Craving for Cigarettes (QSU)	109.5 (31.5)	123.9 (39.1)	0.14	
	Stage of change RCQ	2.2 (0.5)	1.7 (0.5)	0.013	
	SCQA-Health risk	33.9 (4.0)	32.6 (43.0)	0.21	
	SCQA-negative social impression	11.6 (6.8)	8.3 (5.4)	0.06	
	SCQA negative physical feelings	11.7 (6.7)	8.3 (5.4)	0.04	
	SCQA Taste-sensorimotor manipulation	15.8 (7.3)	19.8 (6.9)	0.04	
	SCQA-Boredome Reduction	19.3 (7.8)	20.0 (7.3)	0.73	
	SCQA Stimulation	11.8 (6.8)	10.4 (7.6)	0.46	
	SCQA Negative Affect reduction	26.5 (8.1)	26.0 (11.4)	0.85	
	SCQA Social facilitation	15.5 (7.1)	14.3 (12.2)	0.69	
	SCQA Weight control	8.8 (9.0)	7.0 (9.5)	0.45	
	Alcohol related factors	SER-G-Temptation	36.3 (6.6)	38.1 (5.7)	0.27
SER-G Confidence		19.8 (7.3)	15.0 (5.6)	0.01	
Alcohol dependence severity (ADS)		17.3 (7.0)	19.8 (6.9)	0.18	
Age at onset alcohol dependence		31.7 (10.7)	26.0 (10.5)	0.02	
Duration of alcohol dependence		12.4 (10.2)	16.7 (9.9)	0.04	
Longest drinking abstinence period (Months)		19.6 (38.3)	31.7 (42.7)	0.26 ^a	
Alcohol per drinking day (grams)		273.7 (211.0)	284.0 (115.5)	0.32	
Number of ICD criteria		5.6 (0.7)	5.7 (0.6)	0.88	
OCDS-total		17.8 (8.1)	22.6 (7.6)	0.02	
OCDS-Thoughts		7.7 (5.1)	9.6 (5.1)	0.16	
OCDS-actions		10.1 (4.5)	13.1 (4.0)	0.01	
SOKRATES Ambivalence		11.7 (3.8)	10.7 (4.2)	0.35	
SOKRATES Recognition		25.6 (3.6)	26.1 (2.4)	0.56	
SOKRATES Taking Steps		29.0 (3.6)	29.2 (2.2)	0.77	
Abstinence self efficacy – Temptation (AASE)		39.9 (17.4)	48.3 (18.5)	0.07	
Abstinence self efficacy – confidence (AASE)		45.7 (21.2)	35.9 (17.4)	0.08	
General psycho-pathology and well-being		Depressiveness (BDI)	15.5 (10.8)	21.7 (9.7)	0.03
		Global Severity Index BSI	0.8 (0.6)	1.1 (0.6)	0.09
		Perceived Stress Scale (PSS)	21.6 (6.0)	25.9 (6.0)	0.008
	Global quality of life (WHOQoL-BREF)	41.3 (23.6)	39.5 (25.1)	0.77	
	Physical domain (WHOQoL-BREF)	57.6 (19.2)	55.3 (15.5)	0.63	
	Mental domain (WHOQoL-BREF)	50.3 (16.9)	42.5 (20.5)	0.10	
	Social domain (WHOQoL-BREF)	53.2 (22.7)	38.2 (27.0)	0.02	
Personality	Environmental domain (WHOQoL-BREF)	63.5 (16.2)	54.9 (21.6)	0.07	
	Trait anxiety (STAI)	49.6 (9.5)	54.8 (11.7)	0.05	
	Impulsiveness (BIS)	64.6 (9.4)	66.5 (10.2)	0.45	
	Novelty Seeking (TCI)	19.8 (5.6)	21.6 (5.9)	0.23	
	Harm avoidance (TCI)	19.3 (6.2)	23.4 (7.6)	0.02	
	Reward dependence (TCI)	14.7 (3.5)	14.5 (3.4)	0.84	

* regarded as significant according to our more conservative alpha value of 1%; ^a based on nonparametric Mann-whitney U test; v.n.i.l.E. Variable not in the equation of the multiple binary logistic regression model, but was included in the analysis; FTND - Fagerström Test for Nicotine Dependence; QSU - Questionnaire of Smoking Urges; SCQA - Smoking Consequences Questionnaire for Adults; SER-G - Self-Efficacy for smokers german version; OCDS - Obsessive Compulsive Drinking Scale; SOKRATES - Stages of Change Readiness and Treatment Eagerness Scale; AASE - Alcohol Abstinence Self-Efficacy Scale; BDI - Beck Depression Inventory; BSI - Brief Symptom Inventory; WHOQoL-BREF - World Health Organization Quality of Life-Brief instrument; STAI - State-Trait Anxiety Inventory; BIS - Barratt Impulsiveness Scale; TCI - Temperament and Characteristics Inventory

Table S2. Baseline differences between successful participants (smoking abstinence at 3-month follow-up) and unsuccessful participants (any smoking at 3-month follow-up) of the smoking cessation program

		Smoking abstinent at 3-month follow- up (N=9)	Smoking at 3- month follow-up (N=58)	Group comparison p-value
		Mean (SD)	Mean (SD)	
Socio- demographic factors	Age	40.4 (9.6)	45.1 (11.1)	0.24
	Sex	77.8% male	60.3% male	0.31
	Education (0=no education, 5=A-level)	3.6 (0.7)	3.4 (0.9)	0.75 ^a
Smoking related factors	Number of cigarettes per day	28.0 (16.9)	23.8 (9.5)	0.63 ^a
	Age at beginning of smoking	16.4 (2.8)	16.7 (4.2)	0.93 ^a
	Years of smoking	21.2 (8.7)	26.4 (10.3)	0.13 ^a
	Pack years	26.1 (24.7)	29.5 (17.3)	0.18 ^a
	Number of previous quit attempts	2.4 (7.5)	2.3 (3.6)	0.16 ^a
	Tobacco dependence severity (Number of ICD criteria)	4.4 (1.2)	4.4 (1.0)	4.5 (0.8)
	Fagerström Test for Nicotine dependence	5.1 (2.7)	6.1 (2.0)	0.24
	Craving for Cigarettes (QSU)	99.9 (37.1)	112.2 (30.7)	0.34
	Stage of change RCQ	2.4 (0.5)	2.2 (0.4)	0.29 ^a
	SCQA-Health risk	36.0 (0.0)	33.6 (4.1)	<0.001*
	SCQA-negative social impression	15.9 (4.8)	11.3 (7.0)	0.08
	SCQA negative physical feelings	17.6 (6.5)	10.7 (6.1)	0.005*
	SCQA Taste-sensorimotor manipulation	12.3 (9.3)	16.1 (7.0)	0.17
	SCQA-Boredome Reduction	20.3 (8.4)	19.6 (7.7)	0.82
	SCQA Stimulation	9.0 (6.1)	12.1 (7.0)	0.24
	SCQA Negative Affect reduction	23.3 (9.8)	27.4 (7.5)	0.17
	SCQA Social facilitation	14.1 (7.4)	15.4 (7.0)	0.64
	SCQA Weight control	9.8 (10.1)	8.3 (8.6)	0.64
	SER-G-Temptation	31.6 (6.7)	36.9 (5.6)	0.02
SER-G Confidence	22.5 (6.5)	19.4 (6.9)	0.25	
Alcohol related factors	Alcohol dependence severity (ADS)	18.5 (8.2)	17.0 (7.1)	0.60
	Age at onset alcohol dependence	27.9 (8.3)	31.0 (11.8)	0.17 ^a
	Duration of alcohol dependence	12.6 (11.2)	12.2 (10.4)	0.96 ^a
	Longest drinking abstinence period (Months)	5.7 (8.8)	22.9 (42.0)	0.26 ^a
	Alcohol per drinking day (grams)	324.4 (303.5)	259.3 (193.9)	0.83 ^a
	Number of ICD criteria	5.8 (0.4)	5.6 (0.8)	0.62 ^a
	OCDS-total	18.6 (7.5)	17.6 (8.4)	0.75
	OCDS-Thoughts	9.2 (4.7)	7.4 (4.9)	0.32
	OCDS-actions	9.4 (3.9)	10.2 (4.8)	0.64
	SOKRATES Ambivalence	10.8 (3.5)	11.6 (3.9)	0.56
	SOKRATES Recognition	26.9 (1.1)	25.3 (4.0)	0.28
	SOKRATES Taking Steps	30.5 (2.4)	28.5 (3.8)	0.16
	Abstinence self efficacy – Temptation (AASE)	45.4 (10.4)	38.7 (18.1)	0.34
	Abstinence self efficacy – confidence (AASE)	62.6 (14.7)	45.4 (20.3)	0.04
	General psycho- pathology and well-being	Depressiveness (BDI)	12.1 (10.3)	16.2 (11.0)
Global Severity Index BSI		0.7 (0.7)	0.8 (0.6)	0.48
Perceived Stress Scale (PSS)		23.0 (2.4)	24.7 (6.0)	0.55
Global quality of life (WHOQoL-BREF)		39.1 (24.5)	41.3 (24.2)	0.81
Physical domain (WHOQoL-BREF)		66.5 (16.1)	55.3 (19.6)	0.13
Mental domain (WHOQoL-BREF)		58.3 (10.0)	48.0 (17.8)	0.03
Social domain (WHOQoL-BREF)		57.3 (18.1)	51.4 (24.0)	0.51
Environmental domain (WHOQoL-BREF)		75.0 (11.5)	61.5 (15.9)	0.03
Personality	Trait anxiety (STAI)	44.0 (7.0)	50.4 (10.0)	0.09
	Impulsiveness (BIS)	65.5 (14.2)	64.2 (8.7)	0.81
	Novelty Seeking (TCI)	22.9 (5.6)	19.3 (5.5)	0.11
	Harm avoidance (TCI)	18.4 (5.6)	19.6 (6.5)	0.62
	Reward dependence (TCI)	16.9 (4.7)	14.4 (3.4)	0.07

* regarded as significant according to our more conservative alpha value of 1%; ^a based on nonparametric Mann-whitney U test; v.n.i.E. Variable not in the equation of the multiple binary logistic regression model, but was included in the analysis; FTND - Fagerström Test for Nicotine Dependence; QSU - Questionnaire of Smoking Urges; SCQA - Smoking Consequences Questionnaire for Adults; SER-G - Self-Efficacy for smokers german version; OCDS - Obsessive Compulsive Drinking Scale; SOCRATES - Stages of Change Readiness and Treatment Eagerness Scale; AASE - Alcohol Abstinence Self-Efficacy Scale; BDI - Beck Depression Inventory; BSI - Brief Symptom Inventory; WHOQoL-BREF - World Health Organization Quality of Life-Brief instrument; STAI - State-Trait Anxiety Inventory; BIS - Barratt Impulsiveness Scale; TCI - Temperament and Characteristics Inventory

Table S3. Differences at discharge from inpatient treatment between successful participants (smoking abstinence at 3-month follow-up) and unsuccessful participants (any smoking at 3-month follow-up) of the smoking cessation program

		Smoking abstinent at 3-month follow- up (N=9)	Smoking at 3- month follow-up (N=57)	Group comparison p-value
		Mean (SD)	Mean (SD)	
Smoking related factors	Number of cigarettes per day	1.1 (2.3)	8.8 (7.5)	<0.001 ^a
	Craving for cigarettes (QSU)	70.1 (10.0)	87.2 (20.0)	0.002
	Stage of change RCQ	3.0 (0.0)	2.6 (0.5)	0.14 ^a
Alcohol related factors	OCDS-total	12.3 (8.9)	11.9 (7.8)	0.91
	OCDS-thoughts	5.1 (4.0)	4.6 (3.8)	0.75
	OCDS-actions	7.1 (5.2)	7.2 (5.1)	0.95
General psychopathology and well being	Global Severity Index (BSI)	0.4 (0.3)	0.6 (0.5)	0.30
	Global Quality of life (WHOQoL-BREF)	67.2 (22.1)	54.1 (22.9)	0.14
	Physical domain (WHOQoL-BREF)	79.0 (15.0)	62.7 (20.5)	0.04
	Mental domain (WHOQoL-BREF)	68.2 (17.7)	58.1 (19.2)	0.17
	Social domain (WHOQoL-BREF)	62.5 (22.7)	60.3 (21.4)	0.79
	Environmental domain (WHOQoL-BREF)	78.5 (15.1)	66.6 (17.1)	0.07

^a regarded as significant according to our more conservative alpha value of 1%; ^a based on nonparametric Mann-whitney U test;

^{V.N.I.E.} Variable not in the equation of the multiple binary logistic regression model, but was included in the analysis; QSU - Questionnaire of Smoking Urges; OCDS - Obsessive Compulsive Drinking Scale; BSI - Brief Symptom Inventory; WHOQoL-BREF - World Health Organization Quality of Life-Brief instrument;

Differences between groups at discharge and predictors of smoking cessation at the 3-month follow-up

Between those participants of the smoking cessation program who reported smoking abstinence at follow up and those who reported smoking at follow up, the following variables, that were assessed at discharge from the inpatient program differed on a trend level or significant basis: number of daily smoked cigarettes at discharge, physical domain scores of the quality of life instrument and environmental domain scores of the quality of life instrument (see table 3; for all comparisons see supplementary table S3).

The multiple binary logistic regression analysis conducted to predict smoking abstinence at follow-up from variables measured at discharge produced a model in which only number of daily smoked cigarettes emerged as significant (OR: 0.60, CI: 0.37 - 0.96, p=0.05) and environmental domain of the quality of life instrument as trend level significant (WHOQoL-BREF, OR: 1.07, CI: 1.00 – 1.14, p=0.053) predictors. The model classified 88.% of the cases correctly and explained 49% of the variability (Nagelkerkes R²=0.49). Therefore, each cigarette that was still being smoked at discharge increased the risk of not being smoking abstinent by 67% (1/0.6=1.67). Each point increase in the quality of life rating regarding an individual's environment at discharge from the clinic increased the odds of smoking abstinence by 7%.

Supplement

Contains univariate analyses of potential predictors of participation in smoking cessation treatment at baseline (Table S1), and univariate analyses of potential

predictors of smoking cessation success after 3 months follow-up at baseline (Table S2) and posttreatment (Table S3).

DISCUSSION

In this prospective study, we simultaneously examined a wide range of variables that were previously identified as predictors of quit attempts and smoking cessation in different studies covering smoking- and alcohol-related factors, general psychopathology, well-being and personality traits. Sample and procedures are of high clinical validity due to few exclusion criteria within a clinical routine setting.

Three predictors of participation in the smoking cessation program were identified: higher stages of change, higher confidence in abstaining from smoking and lower perceived stress.

Smoking abstinence at follow-up was predicted by two factors obtained immediately prior to treatment initiation: higher expectancy of negative physical feelings as a consequence of smoking and lower expectancy of temptation to smoke; and by fewer daily smoked cigarettes at discharge.

Faced with the various predictors that have been proposed by different previous studies, the presented results may help clinical routine settings to select patients according to the described predictors in order to provide tailored and cost effective treatment for both alcohol and nicotine dependence in relatively small samples with little exclusion criteria.

A higher stage of change at baseline predicted participation in the smoking cessation program. This result is in line with previous studies (Boudreaux et al. 2014) where a higher stage of readiness to quit

smoking predicted subsequent quit attempts. This can be interpreted as a validity argument for the RCQ questionnaire and the stage-of-change concept. However, known differences between stated intentions and observable behavior are reflected by the fact that additional factors contributed to our model in predicting treatment participation.

Confidence in abstaining from smoking is a facet of self-efficacy that plays a major role in behavioral change models. Self-efficacy is highly interrelated with stage of change (Martin et al. 2006). In our analysis it was identified as an additional predictor for participation in the smoking cessation program. This is in line with a study on college students, where both motivation to quit and self-efficacy were identified as predictors of subsequent quit attempts (Lee et al. 2014).

The third predictor of treatment participation was lower perceived stress during the past week prior to treatment initiation. Stress relief is a major motive to smoke (Fidler & West 2009). Perceived stress seems to be associated with smoking prevalence from early adolescence on (Siqueira et al. 2001) and has been reported to be associated with perceived barriers to quit smoking (McHugh et al. 2017, Robles et al. 2016). The loss of smoking as a coping strategy to reduce stress has also been described as a barrier to seek smoking cessation treatment by opioid dependent pregnant women (Fallin et al. 2016). Therefore, it seems plausible that alcohol dependent patients perceiving a high amount of stress are not willing to give up on one of their main coping strategies. Another explanation could be that nicotine dependence- and alcohol dependence related factors exert their effect on undertaking an assisted quit attempt via perceived stress. Thus, the inclusion of this variable in our prediction models may have summed up the effects. This is in line with the notion that perceived stress, not objective stressors, is important for initiation of coping mechanisms (Denson et al. 2009). While other variables have previously been suggested as possible predictors for smoking cessation and were simultaneously assessed within our study, these three seem to be the ones that best identify patients that will actually participate in an offered smoking cessation program.

At 3-month follow-up, participants in our smoking cessation program that expected more smoking-related negative physical feelings at baseline had a higher probability of successful quitting. As has been previously reported, the expectation/experience of negative physical feelings due to smoking, such as lung pain, for example, is a predictor of readiness to quit smoking (Pulvers et al. 2004) and reductions in these expectancies during a quit attempt were associated with improved smoking cessation outcome (Weinberger et al. 2010). Therefore, our finding corroborates previous findings and points to the importance of this factor. Enhancing the expectation of negative physical feelings due to

smoking, for instance by examining and informing smokers of their “lung age” may be a successful strategy to increase success rates, as has been demonstrated for patients with asthma (Perret et al. 2016)

As a second baseline predictor of smoking abstinence at follow-up, we identified lower self-reported temptation to smoke. This is in line with other studies that reported restrictive smoking policies (Betzner et al. 2012) and restrictions on smoking retail displays (Hoek et al. 2010) to support quit attempts by reducing the number of tempting situations. Furthermore, temptation resistance expectancy is part of self-efficacy, which has recently been shown to predict smoking abstinence post-treatment in patients with other substance use disorders (Vander Weg, et al. 2017). However, another study suggests separate pathways for smoking temptation and relapse (Bold, et al. 2016). Interestingly, while confidence in smoking abstinence as part of self-efficacy predicted treatment participation, expectation of tempting situations seems to be a predictor of treatment success. Both aspects are part of the concept of self-efficacy. A recent meta-analysis of self-efficacy reported a moderate association between self-efficacy assessed before a quit attempt and smoking cessation but points to various confounders that could result in overstating the association (Gwaltney, et al. 2009). Thus, it seems plausible that self-efficacy might affect quit attempts differently than abstinence.

An additional predictor for treatment success at 3-month follow-up was the number of cigarettes that were smoked at the end of the treatment. The fewer daily cigarettes were smoked at discharge, the higher the probability of smoking cessation success was three months later. This is in line with recommendations given by cognitive behavioral programs which prefer “cold turkey” cessation rather than stepwise reductions (Perkins et al. 2008). This result points to the necessity of supporting patients as much as possible to fully stop smoking while still in treatment.

No quality of life indicator investigated in our sample showed significant predictive power, neither for participation nor for smoking cessation. However, environmental domain scores of the quality of life instrument – resembling self-report data on the satisfaction with the environment that respondents live in - tended to predict smoking cessation success at discharge. It is therefore possible that quality of life may indeed yield significant predictive power in samples larger than the one presently examined. However, this would likely disqualify the predictor as a clinically useful tool effective at identifying patients from within small samples.

Besides the strengths of this study, including a psychometrically well characterized sample, prospective design, clinical validity due to a low number of exclusion criteria in a natural clinical setting without

study-funded add-on treatment, limitations need to be addressed: a.) no biomarkers were used to verify smoking status during inpatient treatment and at follow-up. In addition, we did not assess continuous abstinence, but only point abstinence during the past seven days at follow up. Therefore, possible social desirability biases cannot be ruled out b.) the recruitment of patients that were admitted to the ward of one clinic leads to limitations regarding the generalizability of our results and resulted in an overall low number and consequently a low number of successful quitters c.) the multiple comparisons bear the risk of reporting false positive effects. Hence, conclusions drawn from this exploratory research have to be regarded as preliminary. Furthermore bupropion, an anti-depressant that has shown efficacy in smoking cessation but is a second line medication according to the German guidelines on smoking cessation treatment, was not offered in our study. Thus the results are limited in this aspect.

CONCLUSIONS

Predictors of participation in a smoking cessation program are not the same as those for successful smoking cessation. This holds true for alcohol dependent smokers and smokers in general (Kale et al. 2015). Our results suggest that smoking alcohol dependent patients are most likely to participate in a smoking cessation program when high motivation and high self-efficacy as well as low levels of perceived stress are presented when admitted to a clinic for alcohol withdrawal and dependence treatment. Using these measures as targets for treatment and as indicators for offering smoking cessation treatment could increase the opportunity to improve the health risks of smoking alcohol dependent patients who are reluctant to join smoking cessation programs (Fiore et al. 2008) despite being at a higher risk for vascular diseases and cancer.

Participation will be most successful if participants have a high expectation of negative physical feelings and expect little temptations to smoke before enrolling in the program. Furthermore, efforts should aim at achieving abstinence while in treatment, which appears to be predictive of long-term abstinence from smoking. Treatment allocation and additional support could be tailored to these factors.

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Contribution of individual authors:

Ulrich Frischknecht involved in planning the study design, wrote the first draft, supported data management, involved in planning and conducting the statistical Analysis, reviewed and approved the final version.

Toni Pätz involved in planning the study design, conducted data collection and data management, reviewed and approved the final version.

Iris Reinhard involved in planning and conducting the statistical Analysis as an expert in Biostatistics, reviewed and approved the final version.

Christina Dinter involved in planning the study design, supported data collection and data management, reviewed and approved the final version.

Falk Kiefer involved in planning the study design, supported data collection, reviewed and approved the final version.

Tillmann Weber supervised planning the study design, supported and supervised data collection, supervised writing of the draft, reviewed and approved the final version.

References

1. Apollonio D, Philipps R & Bero L: *Interventions for tobacco use cessation in people in treatment for or recovery from substance use disorders*. *Cochrane Database Syst Rev* 2016
2. Bandiera FC, Anteneh B, Le T, Delucchi K & Guydish J: *Tobacco-related mortality among persons with mental health and substance abuse problems*. *PLoS One* 2015; 10:e0120581
3. Batra A, Hoch E, Mann K & Petersen KU: *S3-Leitlinie Screening, Diagnose und Behandlung des schädlichen und abhängigen Tabakkonsums*. Springer-Verlag, 2015
4. Betzner AE, Boyle RG, Luxenberg MG, Schillo BA, Keller PA, Rainey J. et al.: *Experience of smokers and recent quitters with smokefree regulations and quitting*. *Am J Prev Med* 2012; 43:S163-70
5. Bleich S, U H-R & Kornhuber J: *Fagerström-Test für Nikotinabhängigkeit (FTNA)*. Manual. Beltz Test GmbH, Göttingen, 2002
6. Bold KW, McCarthy DE, Minami H, Yeh VM, Chapman GB & Waters AJ: *Independent and interactive effects of real-time risk factors on later temptations and lapses among smokers trying to quit*. *Drug Alcohol Depend* 2016; 158:30-7
7. Bott K, Rumpf HJ, Bischof G, Meyer C, Hapke U & John U: *Alkoholabstinentz-Selbstwirksamkeitsfragebogen*. 2003
8. Boudreaux ED, Abar B, O'Hea E, Sullivan AF, Cydulka R, Bernstein SL et al.: *Cognitive and affective predictors of smoking after a sentinel health event*. *Psychol Health Med* 2014; 19:402-9
9. Burling AS & Burling TA: *A comparison of self-report measures of nicotine dependence among male drug/alcohol-dependent cigarette smokers*. *Nicotine Tob Res* 2003; 5:625-33
10. Cloninger CR, Przybeck TR, Svrakic DM & Wetzel RD: *The Temperament and Character Inventory (TCI): A Guide*

- to Its Development and Use. Center for sychobiology of Personality, Washington University, 1994
11. Cohen S, Kamarck T & Mermelstein R: A global measure of perceived stress. *J Health Soc Behav* 1983; 24:385-96
 12. Conrad I, Matschinger H, Kilian R & Riedel-Heller S: WHOQOL-100, WHOQOL-BREF und WHOQOL-OLD. Interkulturell vergleichbare WHO-Instrumente zur Erfassung der subjektiven Lebensqualität. *Klinische Diagnostik und Evaluation* 2009; 2:133-44
 13. Copeland AL, Brandon TH & Quinn EP: The Smoking Consequences Questionnaire-Adult: Measurement of smoking outcome expectancies of experienced smokers. *Psychol Assess* 1995; 7:484-94
 14. Denson TF, Spanovic M & Miller N: Cognitive appraisals and emotions predict cortisol and immune responses: A meta-analysis of acute laboratory social stressors and emotion inductions. *Psychol Bull* 2009; 135:823-53
 15. Fagerstrom KO & Schneider NG: Measuring nicotine dependence: a review of the Fagerstrom Tolerance Questionnaire. *J Behav Med* 1989; 12: 159-82
 16. Fallin A, Miller A & Ashford K: Smoking Among Pregnant Women in Outpatient Treatment for Opioid Dependence: A Qualitative Inquiry. *Nicotine Tob Res* 2016; 18:1727-32
 17. Fidler JA & West R: Self-perceived smoking motives and their correlates in a general population sample. *Nicotine Tob Res* 2009; 11:1182-8
 18. Fiore M, Jaen CR, Baker T, Bailey W, Benowitz N, Curry S et al.: Treating tobacco use and dependence: 2008 update. Rockville, MD: US Department of Health and Human Services, 2008
 19. Franke GH: Brief Symptom Inventory - deutsche Fassung. 2000
 20. Frischknecht U, Sabo T & Mann K: Improved drinking behaviour improves quality of life: a follow-up in alcohol-dependent subjects 7 years after treatment. *Alcohol Alcohol* 2013; 48:579-84
 21. Grant, BF, Hasin, DS, Chou S, Stinson FS & Dawson DA: Nicotine dependence and psychiatric disorders in the united states: Results from the national epidemiologic survey on alcohol and related conditions. *Arch Gen Psychiatry* 2004; 61: 1107-15
 22. Guydish J, Passalacqua E, Pagano A, Martinez C, Le T, Chun J et al.: An international systematic review of smoking prevalence in addiction treatment. *Addiction* 2016; 111:220-30
 23. Gwaltney CJ, Metrik J, Kahler CW & Shiffman S: Self-efficacy and smoking cessation: a meta-analysis. *Psychol Addict Behav* 2009; 23: 56-66
 24. Hannöver W, Thyrian JR, Rumpf H-J, Meyer C, Hapke U & John U: Der Fragebogen zur Änderungsbereitschaft bei Rauchern (FAR). In F. Rist & H. Küfner A. Glöckner-Rist (eds). ZUMA, 2001
 25. Heather N & Rollnick S: Readiness to Change Questionnaire: User's Manual (revised version). National Drug and Alcohol Research Center, 1993
 26. Heffner JL, Barrett SW & Anthenelli RM: Predicting alcohol misusers' readiness and ability to quit smoking: a critical review. *Alcohol Alcohol* 2007; 42:186-95
 27. Hoek J, Gifford H, Pirikahu G, Thomson G & Edwards R: How do tobacco retail displays affect cessation attempts? Findings from a qualitative study. *Tob Control* 2010; 19:334-7
 28. Hurt RD, Offord KP, Croghan IT, Gomez-Dahl L, Kottke TE, Morse RM. et al.: Mortality following inpatient addictions treatment. Role of tobacco use in a community-based cohort. *JAMA* 1996; 275: 1097-103
 29. Jacques D, Manceaux P, de Timary P, Tecco J, Reynaert C & Zdanowicz N: Proposing concurrent alcohol and tobacco withdrawal. Analysis of the perceptions of Belgian nurses in the alcoholism unit. *Psychiatr Danub* 2014; 26(Suppl 1):41-2
 30. Joseph A, Lexau B, Willenbring M, Nugent S & Nelson D: Factors associated with readiness to stop smoking among patients in treatment for alcohol use disorder. *Am J Addict* 2004; 13:405-17
 31. Kale D, Gilbert HM & Sutton S: Are predictors of making a quit attempt the same as predictors of 3-month abstinence from smoking? Findings from a sample of smokers recruited for a study of computer-tailored smoking cessation advice in primary care. *Addiction* 2015; 110: 1653-64
 32. Kalman D, Kahler CW, Tirsch D, Kaschub C, Penk W & Monti PM: Twelve-week outcomes from an investigation of high-dose nicotine patch therapy for heavy smokers with a past history of alcohol dependence. *Psychol Addict Behav* 2004; 18:78-82
 33. Laux L, Glanzmann P, Schaffner P & Spielberger CD: State-Trait-Angstinventar, 1981
 34. Lee HS, Catley D & Harris KJ: Improving understanding of the quitting process: psychological predictors of quit attempts versus smoking cessation maintenance among college students. *Subst Use Misuse* 2014; 49:1332-9
 35. Mann K, Loeber S, Croissant B & Kiefer F: Qualifizierte Entzugsbehandlung von Alkoholabhängigen. Ein Manual zur Pharmako- und Psychotherapie. Deutscher Ärzte-Verlag, Köln, 2006
 36. Martin RA, Cassidy RN, Murphy CM & Rohsenow DJ: Barriers to Quitting Smoking Among Substance Dependent Patients Predict Smoking Cessation Treatment Outcome. *J Subst Abuse Treat* 2016; 64:7-12
 37. Martin RA, Rohsenow DJ, MacKinnon SV, Abrams DB & Monti PM: Correlates of motivation to quit smoking among alcohol dependent patients in residential treatment. *Drug Alcohol Depend* 2006; 83:73-8
 38. McHugh, RK, Votaw VR, Fulcinii F, Connery HS, Griffin, ML, Monti PM. et al.: Perceived barriers to smoking cessation among adults with substance use disorders. *J Subst Abuse Treat* 2017; 74:48-53
 39. Montazeri A: Quality of life data as prognostic indicators of survival in cancer patients: an overview of the literature from 1982 to 2008. *Health Qual Life Outcomes* 2009; 7:102
 40. Mueller SE, Petitjean SA & Wiesbeck GA: Cognitive behavioral smoking cessation during alcohol detoxification treatment: a randomized, controlled trial. *Drug Alcohol Depend* 2012; 126: 279-85
 41. Müller V, Mucha RF, Ackermann K & Pauli P: Die Erfassung des Cravings bei Rauchern mit einer deutschen Version des "Questionnaire on Smoking Urges" (QSU-G). *Z Klin Psychol Psychother* 2001; 30:164-71
 42. Nakovics, H., Diehl, A., Croissant, B. & Mann, K.: Modifications of the Obsessive Compulsive Drinking Scale (OCDS-G) for use in longitudinal studies. *Addict Behav* 2008; 33: 1276-81

43. Pätz T, Frischknecht U, Bielmeier P, Dinter C, Reinhard I, Mann K et al.: Ergebnisse einer stationären Rauchentwöhnung bei Suchtpatienten im Rahmen einer 3-wöchigen, qualifizierten Entzugsbehandlung. *Suchttherapie*, 2017
44. Patten CA, Martin JE, Calfas KJ, Lento J & Wolter TD: Behavioral treatment for smokers with a history of alcoholism: predictors of successful outcome. *J Consult Clin Psychol* 2001; 69:796-801
45. Perkins KA, Conklin CA & Levine MD: *Cognitive-behavioral Therapy for Smoking Cessation: A Practical Guidebook to the Most Effective Treatments*. Routledge, 2008
46. Perret JL, Bonevski B, McDonald CF & Abramson MJ: Smoking cessation strategies for patients with asthma: improving patient outcomes. *J Asthma Allergy* 2016; 9:117-28
47. Picci RL, Oliva F, Zuffranieri M, Vizzuso P, Ostacoli L, Sodano, A. J. et al.: Quality of life, alcohol detoxification and relapse: is quality of life a predictor of relapse or only a secondary outcome measure? *Qual Life Res* 2014; 23: 2757-67
48. Preuß UW, Rujescu D, Giegling I, Koller G, Bottlender M, Engel RR et al.: *Barratt Impulsiveness Scale - deutsche Fassung*, 2003
49. Prochaska JJ, Delucchi K & Hall SM: A meta-analysis of smoking cessation interventions with individuals in substance abuse treatment or recovery. *J Consult Clin Psychol* 2004; 72:1144-56
50. Pulvers KM, Catley D, Okuyemi K, Scheibmeier M, McCarter K, Jeffries SK et al.: Gender, smoking expectancies, and readiness to quit among urban African American smokers. *Addict Behav* 2004; 29:1259-63
51. Robles Z, Garey L, Hogan J, Bakhshaie J, Schmidt NB & Zvolensky MJ: Examining an underlying mechanism between perceived stress and smoking cessation-related outcomes. *Addict Behav* 2016; 58:149-54
52. Schumann A, Rumpf H-J, Meyer C, Hapke U & John U: Deutsche Version des Fragebogens zur Self-Efficacy für Raucher (SER-G). In A. Glöckner-Rist, F. Rist, & H. Küfner (eds). ZUMA, 2003
53. Seidner AL, Burling TA, Gaither DE & Thomas RG: Substance-dependent inpatients who accept smoking treatment. *J Subst Abuse* 1996; 8:33-44
54. Sheals K, Tombor I, McNeill A & Shahab L: A mixed-method systematic review and meta-analysis of mental health professionals' attitudes toward smoking and smoking cessation among people with mental illnesses. *Addiction (Abingdon, England)* 2016; 111:1536-53
55. Siqueira LM, Rolnitzky LM & Rickert VI: Smoking cessation in adolescents: the role of nicotine dependence, stress, and coping methods. *Arch Pediatr Adolesc Med* 2001; 155:489-95
56. Skinner H & Horn J: *Alcohol Dependence Scale: User's Guide*. Addiction Research Foundation, Toronto, 1984
57. Thurgood SL, McNeill A, Clark-Carter D & Brose LS: *A Systematic Review of Smoking Cessation Interventions for Adults in Substance Abuse Treatment or Recovery*. *Nicotine & Tobacco Research* 2016; 18:993-1001
58. Vander Weg MW, Holman JE, Rahman H, Sarrazin MV, Hillis SL, Fu SS et al.: Implementing smoking cessation guidelines for hospitalized Veterans: Cessation results from the VA-BEST trial. *J Subst Abuse Treat* 2017; 77:79-88
59. Weinberger AH, McKee SA & George TP: Changes in smoking expectancies in abstinent, reducing, and non-abstinent participants during a pharmacological trial for smoking cessation. *Nicotine & Tobacco Research* 2010; 12:937-43
60. World Health Organization: *Global health risks: mortality and burden of disease attributable to selected major risks*. World Health Organization, 2009

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