

ORIGINAL ARTICLE

Improved Drinking Behaviour Improves Quality of Life: A Follow-Up in Alcohol-Dependent Subjects 7 Years After Treatment

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Abstract — **Aim:** The present study relates alcohol-dependent patients' Quality of Life (QoL) 7 years after treatment to drinking status as the conventional endpoint of trials. Potential moderating factors such as patients' smoking status, additional healthcare usage and stressful life events were accounted for. **Methods:** Seven years after being treated for alcoholism, $n = 127$ alcohol-dependent patients filled out the Munich List of Quality of Life Dimensions (MLDL), a generic QoL questionnaire and were re-examined in telephone interviews. Patients' drinking and smoking behaviours during the previous year and additional healthcare usage and whether or not they had experienced stressful life events during the whole follow-up period were assessed. **Results:** Patients reporting abstinence or improved drinking showed significantly higher QoL ratings than patients whose drinking had not improved. Smoking status had no significant effect on QoL. Patients who used additional healthcare during the follow-up period reported lower QoL. The same was true of those who had experienced stressful life events. **Conclusions:** Improved drinking after a 7-year follow-up is associated with improved QoL even when considering other factors such as additional healthcare use and stressful life events. We conclude that QoL can be an additional endpoint in treatment trials.

INTRODUCTION

Quality of Life (QoL) is getting more and more attention in clinical studies (Donovan *et al.*, 2005). It is used as an additional outcome criterion to help broaden the evaluation of therapeutic approaches (LoCastro *et al.*, 2009). This broadened evaluation seems especially useful in the context of chronic disorders, where it is often possible to improve patients' living conditions, although total recovery with a complete absence of symptoms may be out of reach. Alcohol dependence is usually seen as a chronic relapsing disorder (Cunningham and McCambridge, 2012), and several studies have shown reductions in alcoholics' QoL and its recovery with abstinence over shorter periods of time (Peltzer and Pengpid, 2012; for a review, see Donovan *et al.*, 2005). QoL can also serve as a measure of treatment outcomes in clinical-treatment trials by providing information on treatment effectiveness, thus supplementing the consumption/abstinence criteria used in most studies of alcohol treatments (e.g. COMBINE, Anton *et al.*, 2006; PREDICT, Mann *et al.*, 2012). However, there are little data showing the effects of long-term abstinence on QoL. In studies with a long follow-up period, one needs to keep in mind that other factors may influence QoL in alcohol-dependent patients as well, for example additional healthcare usage, smoking or stressful life events. Additional healthcare usage such as mutual help group attendance (Gossop *et al.*, 2003) or other brief interventions usually applied by general practitioners (Pal *et al.*, 2007) have also been shown to increase QoL in alcohol-dependent patients. Smoking and nicotine dependence are highly prevalent among alcoholics (Le Strat *et al.*, 2010; Aubin *et al.*, 2012; Sarsour *et al.*, 2012). Some have speculated that treatment interventions for alcoholism may have a carryover effect into reduced smoking (Hintz and Mann, 2007). Smoking has also been associated with reduced QoL (Rasch and Greiner, 2009), whereas abstinence from nicotine increases QoL (Hays *et al.*, 2012). Stressful life events like problems with partners, financial problems, bereavement and

unemployment have been shown to influence QoL as well (Sherbourne *et al.*, 1992; Han *et al.*, 2006).

To our knowledge, no study has examined the effects of changes in drinking behaviours on QoL in a long-term follow-up over 7 years while considering possible other effects from additional healthcare usage, smoking behaviour and stressful life events.

We analysed data from a 7-year follow-up of alcohol-dependent subjects who had been treated for alcoholism in a combined in- and outpatient programme at the University Hospital in Tübingen, Germany (Mann and Batra, 1993; Mann *et al.*, 2005). Our hypothesis was that abstinent alcoholics would have higher QoL than non-abstinent alcoholics and that non-smokers and patients who had given up smoking during the follow-up would have higher QoL than the smokers. Since we chose a follow-up period of 7 years, we also tried to capture long-term stressful life events and healthcare usage.

METHODS

Subjects and methodology

After a follow-up period of 7 years, we successfully examined the quality-of-life judgments of $n = 127$ out of $n = 190$ alcohol-dependent patients (diagnosed according to the DSM-III criteria) who had been undergoing 6 weeks of inpatient treatment followed by a community-based outpatient treatment for 1 year. The goal of the treatment was alcohol abstinence. Smoking was not addressed. The general treatment approach was described earlier (Mann and Batra, 1993). During the follow-up period, $n = 21$ patients had died, no information on another $n = 30$ patients could be obtained and $n = 12$ of the patients participating in the telephone interview did not provide information on their QoL. There were no differences in daily alcohol intake 3 months before treatment entry, age of onset of alcohol dependence, age or sex between the sample of interest here and those who got lost during the

follow-up period (all $ps > 0.10$). Details of the original sample and of those patients who were not available for follow-up are also provided elsewhere (Hintz and Mann, 2007). Patients were contacted and informed via telephone and, after agreeing to participate in the study, they were sent a questionnaire assessing their partnership status, housing situation, employment and finances, their drinking and smoking behaviours during the previous year, any critical life events they had experienced and any additional healthcare they had utilized for alcohol problems during the whole follow-up period of 7 years. Their QoL within the last week was assessed using the Munich List of Quality of Life Dimensions (MLDL; Heinisch *et al.*, 1991; Ludwig, 1991; von Steinbüchel *et al.*, 1999; see below), which has previously been used successfully in studies of psychiatric disorders (Naber *et al.*, 2005; Grehl *et al.*, 2011). The mean age of the available sample at the time of treatment enrolment was 42.4 years ($SD = 8.4$) and the mean duration of alcohol dependence was ~9 years ($M = 9.2$, $SD = 6.3$); 86% of the patients were male. The mean daily alcohol intake in the 3 months preceding admission to the initial index treatment was 184.7 g ($SD = 135.4$ g), which equals ~15 standard alcoholic drinks per day. At treatment entry there were 38% non-smokers and 62% smokers (of whom 33.3% were heavy smokers). An extensive description of the changes in smoking behaviour during the 7-year follow-up can be found in Hintz and Mann (2007). The study was approved by the ethics committee of the medical faculty of the University of Tübingen. Study participation was not remunerated.

Assessment of QoL: the MLDL

The MLDL is a self-report scale where 19 items assess respondents' satisfaction during the last week on one overall scale and four subscales using Likert scales ranging from 0 (very unsatisfied/very unimportant) to 10 (very satisfied/very important). Internal consistency, criterion and construct validity of the scale have been tested and found to be adequate for research purposes (Heinisch *et al.*, 1991; von Steinbüchel *et al.*, 1999). The following QoL domains are assessed (mean of healthy controls, number of items and Cronbach's alpha in parenthesis, taken from the von Steinbüchel, 1999 study): 'overall' (mean: 8.19; $n = 19$; $\alpha = 0.88$), 'physical aspects' (mean: 7.57; $n = 5$; $\alpha = 0.74$), 'psychological aspects' (mean: 8.34; $n = 4$; $\alpha = 0.82$), 'social life' (mean: 8.68; $n = 5$; $\alpha = 0.77$) and 'everyday life' (mean: 8.27; $n = 5$; $\alpha = 0.67$). In addition to rating one's satisfaction, the scale also asks for the personal relevance of every item using Likert scales from 0 (very unimportant) to 10 (very important). There is a calculation algorithm to use relevance-weighted satisfaction scores. Since we found no differences in relevance ratings in the group comparisons of interest in this study, we used the unweighted satisfaction scores only.

Assessment of alcohol and nicotine consumption

Outcomes for alcohol consumption were defined, according to a landmark study conducted in Germany (Küfner *et al.*, 1989), as follows: 'abstinent' if patients did not consume any alcohol or had only one drinking episode of <1 week in the year before the follow-up examination. 'Improved' if patients drank on less than half of the days during the year prior to the follow-up investigation and their daily alcohol consumption did not

exceed 30 g for women and 60 g for men and no signs of severe alcohol-related diseases (e.g. Wernicke–Korsakoff syndrome, hepatic encephalopathy or pancreatitis) were present. The rest of patients were classified as 'unimproved'.

Smoking outcomes were defined as 'abstinent' if patients had not smoked at all during the year preceding the follow-up, as 'smokers' if patients had smoked up to 20 cigarettes per day during the previous year and as 'heavy smokers' if patients had smoked >20 cigarettes per day. This classification is in line with other studies in tobacco research (Wakabayashi, 2008) and has been shown to be of relevance in QoL research (Vogl *et al.*, 2012).

Additional information on stressful life events occurring during the follow-up

Participants gave information about whether or not they had experienced any of several stressful life events that are severe enough to be remembered and that have previously been shown to influence QoL (Sherbourne *et al.*, 1992; Han *et al.*, 2006). The following life events were noted: financial problems ($n = 7$), loss of significant others ($n = 4$), lawsuits ($n = 2$), physical ($n = 20$) or mental disorders ($n = 4$) and other ($n = 15$). Patients were classified as either having reported no such life event ($n = 83$) or having reported at least one such life event ($n = 45$) during the follow-up period.

Additional information on healthcare utilization during the follow-up

A total of 38 participants reported additional healthcare usage during the 7-year follow-up period. Eight went in for a short-term, inpatient 'crisis intervention' after having had a relapse, 9 went in for at least one additional inpatient detoxification, 5 received psychological help, 18 were attending self-help groups on a regular basis, 9 were visiting their general practitioner for additional help with alcohol problems and 9 were using other healthcare services (residential therapy, residential care, outpatient treatment).

Statistics

Our main dependent measure, QoL (assessed using the MLDL), provides four domain scores as well as one overall QoL score. We used multivariate analyses of variance to investigate group differences in the domain scores, which helped reduce the family-wise error rate. To avoid the problem of multicollinearity, we also performed a separate univariate analysis of variance to test the group differences in the overall QoL. In all models, we included age and sex as covariates to rule out the possibility of these demographic factors biasing the results. When necessary, Fisher's LSD *post hoc* test was applied. Spearman's rho was calculated for non-parametric analyses of the correlations between variables related to drinking and those related to QoL. Statistical analyses were performed using SPSS 20.0. Since drinking outcomes were associated not only with having experienced a stressful life event during the follow-up period ($\chi^2 < 0.001$) but also with additional healthcare usage ($\chi^2 < 0.001$), we performed a stepwise regression analysis using the backward method. This enabled us to isolate each of these factors and investigate their separate influence on QoL by interpreting partial R^2 values.

RESULTS

QoL and drinking outcomes

Drinking outcomes had a significant main effect on QoL both in the multivariate analysis of variance for the QoL domains ($P = 0.006$) and in the univariate analysis of variance for the overall QoL score ($P = 0.001$). *Post hoc* tests showed significantly higher QoL for subjects who abstained from alcohol compared with those whose drinking remained unimproved (all P 's < 0.05). Interestingly, the QoL of those subjects ($n = 20$) whose drinking behaviour improved but who did not abstain from alcohol was no different from the QoL of those who abstained from alcohol completely. Furthermore, 'improved' subjects' QoL was significantly higher compared with the 'unimproved' group in the domains 'physical aspects', 'social life' and 'overall', and showed a trend advantage in 'psychological aspects' (see Table 1).

In addition to the investigation of group differences based on the drinking outcomes classification according to Küfner *et al.* (1989), we analysed the association between markers of alcohol use and QoL scores using Spearman correlations. With regard to the multiple testing, we chose a more conservative P -threshold of $P < 0.01$ under which we would consider results to be significant. Our results (see Table 2) showed significant associations: most notably, the more intoxications a patient reported during the previous month, the lower his or her QoL ratings, and the more months a patient reported being abstinent during the follow-up period, the higher his or her QoL ratings. There were no relevant associations between QoL scores and either duration of relapse or the number of drinking days during the previous month. However, the number of relapses during the follow-up period seemed to be of relevance to the QoL domain 'everyday life'.

Table 1. Differences in QoL scores grouped according to drinking outcomes, smoking outcomes, stressful life event and additional healthcare usage

		MLDL QoL scores				
		Overall*	Physical	Psychological	Social life	Everyday life
Drinking outcomes	Abstinent ($n = 77$)	8.22 (1.58) ^a	8.50 (1.57) ^a	8.14 (1.76) ^a	8.00 (2.03) ^a	8.44 (1.59) ^a
	Improved ($n = 20$)	7.99 (1.30) ^a	8.39 (1.33) ^a	7.80 (2.04) ^b	8.32 (2.01) ^a	7.79 (1.31)
	Unimproved ($n = 30$)	6.87 (1.87)	7.18 (1.89)	6.80 (1.91)	6.68 (2.27)	7.41 (2.15)
		$F(2, 122) = 7.00$ $P = 0.001$ Partial $\eta^2 = 0.10$	$F(2, 116) = 4.78$ $P = 0.004$ Partial $\eta^2 = 0.09$	$F(2, 116) = 4.94$ $P = 0.009$ Partial $\eta^2 = 0.08$	$F(2, 116) = 4.91$ $P = 0.018$ Partial $\eta^2 = 0.07$	$F(2, 116) = 3.23$ $P = 0.043$ Partial $\eta^2 = 0.05$
Smoking outcomes	Abstinent ($n = 54$)	8.03 (1.92)	8.32 (1.79)	7.99 (1.92)	8.08 (1.32)	8.28 (1.75)
	Moderate ($n = 47$)	7.89 (1.41)	8.13 (1.43)	7.88 (1.63)	7.79 (2.17)	8.02 (1.59)
	Heavy ($n = 21$)	7.23 (1.71)	7.66 (1.97)	6.90 (2.30)	6.85 (2.57)	7.65 (2.16)
		$F(2, 117) = 1.61$ $P = 0.21$ Partial $\eta^2 = 0.03$	$F(2, 110) = 0.95$ $P = 0.39$ Partial $\eta^2 = 0.02$	$F(2, 110) = 2.42$ $P = 0.093$ Partial $\eta^2 = 0.042$	$F(2, 110) = 2.06$ $P = 0.13$ Partial $\eta^2 = 0.036$	$F(2, 110) = 0.63$ $P = 0.53$ Partial $\eta^2 = 0.011$
Stressful life event	No ($n = 83$)	8.20 (1.54)	8.53 (1.56)	8.03 (1.82)	8.15 (1.83)	8.46 (1.49)
	Yes ($n = 45$)	7.17 (1.75)	7.47 (1.71)	7.26 (1.94)	6.93 (2.44)	7.39 (1.96)
		$F(1, 126) = 11.16$ $P = 0.001$ Partial $\eta^2 = 0.08$	$F(1, 117) = 11.51$ $P < 0.001$ Partial $\eta^2 = 0.09$	$F(1, 117) = 4.36$ $P = 0.039$ Partial $\eta^2 = 0.04$	$F(1, 117) = 8.46$ $P = 0.004$ Partial $\eta^2 = 0.07$	$F(1, 117) = 9.80$ $P = 0.002$ Partial $\eta^2 = 0.08$
Additional healthcare usage	No ($n = 89$)	8.22 (1.46)	8.47 (1.49)	8.11 (1.62)	7.98 (2.02)	8.49 (1.50)
	Yes ($n = 38$)	6.90 (1.84)	7.31 (1.87)	6.79 (2.21)	7.03 (2.34)	7.01 (1.90)
		$F(1, 123) = 19.21$ $P < 0.001$ Partial $\eta^2 = 0.14$	$F(1, 116) = 13.12$ $P < 0.001$ Partial $\eta^2 = 0.10$	$F(1, 116) = 12.63$ $P < 0.001$ Partial $\eta^2 = 0.10$	$F(1, 116) = 4.03$ $P = 0.047$ Partial $\eta^2 = 0.03$	$F(1, 116) = 18.31$ $P < 0.001$ Partial $\eta^2 = 0.14$

Sex and age were included as covariates in all models.

^a*Post hoc* test revealed significant ($P < 0.05$) difference from the 'unimproved' group.

^b*Post hoc* test revealed a trend ($P < 0.10$) difference from the 'unimproved' group.

*Results from separate univariate ANOVA for overall score.

Table 2. Associations between QoL and markers of alcoholism in the total sample of $n = 127$ patients successfully completing the follow-up (Spearman's ρ s)

	Quality of Life Domains of the MLDL				
	Physical	Psychological	Social life	Everyday life	Total QoL
Number of relapses during the follow-up period	-0.207*	-0.233*	-0.096	-0.257**	-0.236*
Duration of relapses	-0.132	-0.124	-0.049	-0.208*	-0.161
Drinking days during the previous month	-0.190*	-0.219*	-0.097	-0.066	-0.164
Number of intoxications during the previous month	-0.375**	-0.347**	-0.279**	-0.248**	-0.347**
Months of abstinence during the follow-up period	0.317**	0.301**	0.148	0.321**	0.316**

Bold, for clarity purposes.

* $P < 0.05$.

** $P < 0.01$.

Stressful life events and additional healthcare usage during the follow-up period and reduced QoL

All QoL scores were significantly lower for the patient group that had experienced stressful life events during its follow-up period than for that group whose patients had not experienced such an event (all $P < 0.05$; for details see Table 1).

Patients who had utilized additional healthcare for alcoholism treatment during their follow-up period reported significantly lower QoL scores (all $P < 0.05$; for details see Table 1). A secondary analysis revealed that this effect is due to a significantly reduced QoL in those additional healthcare users that did not visit mutual help groups ($n = 20$) while those who participated in mutual help groups on a regular bases and those who did not use any additional healthcare did not differ in respect to their QoL (for the overall QoL score: $F(2, 124) = 18.01$, $P < 0.001$; for the multivariate analysis of the QoL domains: $F(8, 226) = 4.60$, $P < 0.001$).

QoL and smoking behaviour

QoL scores followed a pattern, with non-smokers having higher QoL scores than moderate smokers, who again had higher scores than heavy smokers. These differences were not significant (univariate ANOVA for overall QoL and multivariate test for other four QoL scores: $P > 0.10$). However, in the univariate test there was a statistical trend difference for the QoL domain ‘psychological aspect’ and a *post hoc* test showed abstinent subjects’ QoL being significantly higher than that of heavy smokers ($P < 0.05$; for details see Table 1).

Distinct effects of drinking, stressful life events and additional healthcare usage on QoL

There were significant relations between drinking outcomes and both additional healthcare usage and stressful life events ($\chi^2 = 35.71$, $P < 0.001$, and $\chi^2 = 9.66$, $P < 0.01$, respectively). To estimate the separate contribution of the factors ‘drinking outcomes’, ‘additional healthcare usage’ and ‘stressful life events’ on QoL ratings, multiple stepwise regression analyses were performed using the backward method. Drinking outcomes were dichotomized so that those patients whose alcohol consumption improved (including abstainers) now stood in

contrast to those whose consumption was unimproved. Results—displayed in Table 3—indicate that drinking outcomes contributed significantly to all QoL scores, with the exception of the domain ‘everyday life’, with standardized betas of around 0.23 and partial R^2 -values between 0.06 and 0.09. Patients’ utilization of additional healthcare contributed to all QoL scores except for ‘social life’, with standardized betas from -0.25 up to -0.37 and partial R^2 -values between 0.06 and 0.15. The occurrence of stressful life events also remained a significant predictor for all QoL scores, except for the domain ‘psychological aspects’, with standardized betas of ~ 0.2 and partial R^2 -values of about 0.06, even after controlling for drinking outcomes and additional healthcare usage. Taken together, variance in QoL scores could be explained up to around 20% by drinking outcomes, additional healthcare usage and stressful life events.

DISCUSSION

QoL and abstinence from alcohol

This study shows that alcohol-dependent patients report higher QoL not only when they completely abstain from alcohol but also when they improve their drinking behaviour. This was true compared with patients who continued to drink at an ‘unimproved’ level assessed during the last year of a 7-year follow-up period. The effect remained after controlling for stressful life events and/or additional healthcare usage during the whole follow-up period. Apart from the number of intoxications during the previous month QoL seemed to be best predicted by the number of months the patient had maintained sobriety during the follow-up period. Our study supports earlier results (Donovan *et al.*, 2005; Dawson *et al.*, 2009) and extends them to a follow-up period of 7 years.

There are two possible explanations for the finding of improved QoL in the patients that improved their drinking but did not completely abstain. Firstly, there might have been different starting points for those who are capable of maintaining ‘improved’ drinking behaviour without relapsing back into severe drinking. While all patients had to have had severe alcohol problems in order to be admitted to the original 6-week inpatient treatment, we do not have data on differences in severity among the patients at treatment entry. Secondly,

Table 3. Prediction of QoL scores using improvement in alcohol consumption, major life event and additional healthcare usage: results from multiple backwards linear regressions

Predictors	Quality of Life scores from the MLDL as dependent variables in multiple regressions				
	Overall Standardized beta (P-value)	Physical Standardized beta (P-value)	Psychological Standardized beta (P-value)	Social Standardized beta (P-value)	Everyday life Standardized beta (P-value)
Improvement in alcohol consumption ^a	-0.230 (0.006)	-0.246 (0.003)	-0.233 (0.007)	-0.237 (0.008)	(-0.118) ^b (0.156) ^b
Additional healthcare usage	-0.278 (0.001)	-0.247 (0.003)	-0.282 (0.001)	(-0.127) ^b (0.154) ^b	-0.369 (<0.001)
Major life event	-2.18 (0.008)	-0.228 (0.006)	(-0.129) ^b (0.125) ^b	-0.238 (0.007)	-0.218 (0.008)
	$R^2 = 0.237$ $F(3, 121) = 12.50$ $P < 0.001$	$R^2 = 0.232$ $F(3, 121) = 29.41$ $P < 0.001$	$R^2 = 0.163$ $F(2, 121) = 11.89$ $P < 0.001$	$R^2 = 0.128$ $F(2, 115) = 35.05$ $P < 0.001$	$R^2 = 0.206$ $F(2, 122) = 15.81$ $P < 0.001$

^aImprovement here is both ‘abstinent’ and ‘improved’ vs. ‘unimproved’.

^bThese predictors were excluded from the model in the backward algorithm because their contribution to predicting the respective dependent variable was not significant.

the criteria for 'improved' drinking behaviour may include patients who underwent additional treatment at some point during the previous year, because they had drunk in the first half of the year. Now being abstinent they still formally fulfil the criteria for our 'improved' category, although in reality they had been sober since their most recent treatment. The fact that 15 out of the 20 patients in the 'improved' group reported additional healthcare usage during the follow-up period could be in line with this explanation.

QoL and abstinence from smoking

Patients' smoking status had no significant effect on their QoL, although the nominal values differed as we expected, with heavy smokers reporting the lowest QoL and abstainers the highest.

This may be due to the small sample we used, compared with the sample sizes used in studies that showed an effect of smoking on QoL (Rasch and Greiner, 2009). These studies used mostly survey-based data, with several thousand participants, but they did not control for other psychiatric conditions that are highly comorbid with smoking. Another possible explanation comes from the social-psychological determinants of QoL judgments: it has been argued that subjective QoL ratings are formed by an interaction of personal target-performance comparisons (i.e. 'what social relations do I want to have' vs. 'what social relations do I actually have') and certain frames of reference (i.e. 'how relevant/important are social relations to me', for an overview, see Pukrop, 2003). It could be that the questioning, carried out by staff of an alcohol treatment facility where quitting smoking was not a goal of the treatment programme, might have primed these frames of reference in favour of alcohol-related references. For example, when judging his QoL, a patient may have considered his improved ability to drive a car while sober, but not his improved lung function since quitting smoking. This referencing effect may partially account for 'improved' alcoholics' higher QoL, since they have a positive target-performance comparison, too.

Additional healthcare usage, stressful life events and reduced QoL

The interrelations of drinking outcome, healthcare usage and stressful life events may point to underlying predispositions in some patients, promoting the co-occurrence of these factors. However, both additional healthcare usage and the occurrence of at least one stressful life event during the follow-up period were significantly related to reduced QoL ratings and each of the two factors explained unique proportions of variance in almost all QoL domains when controlling for drinking outcomes.

Additional healthcare usage was the strongest predictor of almost all QoL scores assessed in our study. Patients reported lower QoL when they had used additional healthcare during the follow-up period. This effect could be mediated by the severity of alcohol dependence: more-severe alcohol problems are associated with lower QoL and patients with more-severe alcohol problems might have needed additional healthcare. When drinking outcomes were taken into account and considered as a proxy of the severity of alcohol dependence, additional healthcare usage was still significantly associated with lower QoL in most QoL scores. In an attempt to further

elucidate this we performed a secondary analysis. Patients were split into the three categories 'none', 'additional healthcare plus mutual help group' and 'additional healthcare but no mutual help groups'. QoL reductions were only found in those who did not attend mutual help groups. This is in line with previous research (Gossop *et al.*, 2003). This analysis also showed that more patients using additional healthcare in the improved drinking group also attended mutual help groups ($n = 9/14$) than in the unimproved drinking group (1/14). This could be explained by a stabilizing effect of mutual help groups and by a relapse-driven failure to attend mutual help groups.

The negative effect of stressful life events on QoL can be seen as a logical consequence of what general research on life events has shown (e.g. Tosevski and Milovancevic, 2006). Unfortunately, the few studies in the field of alcoholism treatment that investigated QoL after follow-ups of several years have not assessed the effects of any stressful life events during the follow-up period. Although it may be difficult to investigate the relatedness between stressful life events and alcohol dependence and abstinence, this issue should be addressed in future research in which QoL is used as a long-term outcome measure. Even more so, when cost effectiveness of treatment is being studied (Barbosa *et al.*, 2010).

Overall, QoL in this study reflected changes in drinking behaviour, additional healthcare usage and stressful life events in a sample of previously treated alcohol-dependent patients 7 years after their index treatment. Thus, we conclude that QoL seems useful as an additional endpoint in treatment studies. The higher levels of QoL in improved but not abstinent drinkers also point to the usefulness of QoL in studies where reduced drinking rather than abstinence is defined as the treatment goal.

Limitations

The present study has several limitations. First of all, the lack of baseline QoL measures as well as some other baseline data for the sample makes it difficult to check for the effects of pre-selection bias. It may be that those subjects who continue to drink alcohol in ways that are non-hazardous and non-detrimental to their QoL even years after undergoing treatment have had different baseline characteristics. The number of relapses during follow-up was associated with 'everyday life' QoL. Unfortunately, we do not have more precise data on when exactly and for how long these relapses took place. Thus, a more detailed analysis on the course of drinking and its effect on QoL was beyond the scope of this study. Additionally, one has to keep in mind the different time frames that are covered by our assessed data (QoL = 1 week, drinking and smoking outcome = 1 year, additional healthcare usage and stressful life events = entire follow-up) and its self-report characteristics when interpreting our results. However, self-reports concerning substance consumption have been found to be reliable (Abel, 1992) and valid for use in treatment research in this population (Mundle *et al.*, 1999; Babor *et al.*, 2000).

Another limitation comes from the fact that additional healthcare usage during the follow-up period was assessed with an emphasis on alcohol-related healthcare. Additional healthcare that targeted smoking was not explicitly assessed, which, along with a sample size that was probably too small,

limits our evaluation of the effects of smoking on alcoholics' QoL. Finally, because of the lack of matched healthy controls, we could not replicate previously demonstrated effects of reduced QoL in abstinent alcoholics compared with healthy social drinkers (Saarni *et al.*, 2008).

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