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Postintervention reoffense in DUI repeat offenders receiving alcohol treatment as a diversion intervention: A 2-year follow-up study

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ABSTRACT

Purpose: Alcohol use problems are prevalent among recidivists of driving under the influence of alcohol (DUI). This 2-year postintervention follow-up study explored the preventive effects of 12- or 6-month alcohol treatment in relation to reoffense among repeat DUI offenders who participated in a community-based joint legal–medical intervention program.

Methods: A total of 259 repeat DUI offenders with alcohol use problems were referred from a Prosecutors' Office to a psychiatric hospital to receive alcohol treatment. We divided these participants into two groups on the basis of treatment duration (6- and 12-month groups) and collected their official DUI offense records for 2 years after the intervention. A Cox proportional hazards model was used to examine the hazard ratio of each treatment duration in relation to reoffense. The reoffense rates were compared with a group of DUI offenders (n = 4097) who did not participate in the intervention program (i.e., a nonintervention group).

Results: The baseline characteristics were similar between the two treatment groups. The 2-year reoffense rates for the 12-month treatment, 6-month treatment, and nonintervention groups were 12%, 19%, and 21%, respectively. The hazard ratio for reoffense was lower for the 12-month group than for the 6-month group (hazard ratio: 0.45; 95% confidence interval: 0.21–0.96). Survival analysis revealed that compared with the non-intervention group, reoffense was significantly reduced in the 12-month group but not in the 6-month group.

Conclusion: The 12-month joint legal–medical intervention program for alcohol treatment yielded superior outcomes to the corresponding 6-month program in terms of preventing DUI reoffense for 2 years postintervention. This research is, however, subject to the limitation that we lacked the information of factors that might affect the reoffense risk, such as motivation level, readiness to change, personality traits, and familial support.

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1. Introduction

The repeated occurrence of driving under the influence of alcohol (DUI) is a key public health problem worldwide. The global recidivism rate within a 5-year period among individuals convicted of DUI is 21%–47% (Fell, Tippetts, & Voas, 2009; Nochajski & Stasiewicz, 2006). Repeat DUI offenders are overrepresented among individuals involved in traffic accidents and estimated to be 62% more likely to be involved in a fatal accident (Fell, 2014). The vulnerability of repeat offenders to motor vehicle accidents is higher than that of first-time offenders (Dickson, Wasarhaley, & Webster, 2013). To address recidivism-related dangers, many developed countries have increasingly utilized medical treatment in addition to legal sanctions and punishments for offenders with alcohol use problems (Cheng & Pien, 2018). In Taiwan, DUI is deemed criminal, and offenders are subjected to high fines and imprisonment. More than one-third of DUI offenders in Taiwan have previous DUI offenses (Yuan, 2018), indicating that the current interventions for such offenders are not sufficiently effective.

Some studies have pointed out that depression, anxiety, impulsivity, (Cheng et al., 2021; McMillen, Adams, Wells-Parker, Pang, & Anderson, 1992) are risk factors for DUI recidivism. In addition, alcohol use problems are a major risk factor for DUI recidivism (Cavaiola, Strohmetz, & Abreo, 2007; Nelson, Belkin, LaPlante, Bosworth, & Shaffer, 2015). One study reported that 79% of first-time and 98% of third-time DUI offenders have alcohol use disorder (AUD), suggesting that the prevalence of AUD increases with the number of prior DUI convictions (McCutcheon et al., 2009). Compared with first-time offenders, repeat offenders exhibit greater attentional bias toward alcohol cues and preoccupation with alcohol, leading to greater difficulty in refraining from alcohol consumption before driving (Miller & Fillmore, 2014). Given the prevalence of alcohol use problems among repeat DUI offenders, interventions involving alcohol treatment for such individuals have been proposed as a crucial element in preventing DUI recidivism (Karasov & Ostacher, 2014).

The incorporation of alcohol treatment into the criminal justice system has been practiced in sanctioning processes for decades and played a positive role in reducing the incidence of DUI (Voas & Fisher, 2001; Wells-Parker, Bangert-Drowns, McMillen, & Williams, 1995). One well-known example is the 3-year DUI Intensive Supervision Program in the United States, which provides multiple forms of community-based alcohol treatment as well as frequent judicial monitoring and close supervision to promote compliance with the treatment mandate. Research has indicated the effectiveness of this approach (Gottfredson, Kearley, Najaka, & Rocha, 2005; Lapham, C'De Baca, Lapidus, & McMillan, 2007; Robertson, Gardner, Xu, & Costello, 2009; Wiliszowski, Fell, McKnight, Tippetts, & Ciccel, 2010), citing a 48% reduction in recidivism in repeat DUI offenders during intervention (Lapham, Kapitula, C'De Baca, & McMillan, 2006). Regarding the context of alcohol treatment, a multicomponent approach integrating education, cognitive behavioral therapy, and brief motivational intervention has been suggested as the most effective method for preventing DUI recidivism (DeYoung, 1997; Dill & Wells-Parker, 2006). By contrast, educational courses or psychosocial interventions alone provide only marginal effectiveness (Elder et al., 2005; Timko, Desai, Blonigen, Moos, & Moos, 2011; Vaucher et al., 2016; Williams et al., 2007). A key factor behind the benefits of a multicomponent approach is that DUI offenders are a heterogeneous group characterized by a range of alcohol-drinking behaviors, personalities, and psychological problems (Nelson, Shoov, LaBrie, & Shaffer, 2019; Robertson, Gardner, Walker, & Tatch, 2016); they thus require tailored treatment to target the root causes of DUI on the basis of the needs of each individual.

The duration of intervention for DUI offenders in most studies has been <3 months (Beadnell, Crisafulli, Stafford, Rosengren, & DiClemente, 2015; Ma, Byrne, Haya, & Elzohairy, 2015; Mills, Hodge, Johansson, & Conigrave, 2008; Robertson, Gardner, Xu, Chi, & McCluskey, 2013). By contrast, mandatory intervention periods for illicit drug offenders referred from the legal system tend to be at least 1-year long (Sloan, Gifford, Eldred, & McCutchan, 2016). AUD is a chronic mental health condition, and remission may take several years to achieve (Hagman, Falk, Litten, & Koob, 2022; Palzes et al., 2020; Tucker, Chandler, & Witkiewitz, 2020); therefore, DUI recidivists with alcohol use problems often require an intervention period longer than 3 months. In a previous study, we observed that a longer intervention is associated with a lower recidivism risk within 1 year after intervention. In that study, recidivism rate was 8.6% for those who stayed in the treatment for 4 months or more, whereas the recidivism rate was higher (20.7%) among those with stayed <4 months (Cheng et al., 2021). However, without a comparison group who had not receive the intervention, we were unable to understand whether the intervention program was effective in preventing DUI, particularly among individuals receiving treatment for more than 4 months. In addition, the short follow-up period of only 1 year meant that we were unable to ascertain whether behavioral changes could be maintained beyond 1 year.

DUI convictions are a unique opportunity to bridge the gap between the legal and medical systems' provision of individuals with AUD with alcohol treatment as a countermeasure for DUI (Dill & Wells-Parker, 2006; Voas & Fisher, 2001). In light of this, since 2015, the Taiwan Taipei District Prosecutors Office (TTDPO) has collaborated with Taipei City Hospital (TCH) to develop a joint intervention program that provides community-based alcohol treatment for repeat DUI offenders. As a diversion approach, this program provides an alternative to prosecution or imprisonment if an offender agrees to receive treatment.

Therefore, this study followed the reoffense records of participants in a joint TTDPO-TCH program for 2 years after the end of treatment and divided them into two groups on the basis of length of treatment (6 or 12 months). We aimed to determine the hazard ratio (HR) of DUI reoffense between the two groups. In addition, we compared the reoffense rates of these two groups with that of a control group containing DUI offenders who did not participate in the program within 6, 12, and 24 months. Because depression, anxiety, and impulsivity are associated with DUI recidivism (Cheng et al., 2021; McMillen et al., 1992), we controlled the potential effects of these psychological factors on DUI reoffense. We hypothesized that a longer duration of treatment would be associated with a lower rate of reoffense for up to 2 years after the intervention. We believe that the data collected in this study could be vital to the development of an effective intervention program to curb DUI reoffense.

2. Methods

2.1. Study participants

This observational study was approved by the Research Ethics Committee of TCH (IRB No: TCHIRB-1080510). In Taiwan, the Road Traffic Management and Penalty Act defines DUI as a breath alcohol concentration (BrAC) of ≥0.15 mg/L at the time of offense, for which the offender is subject to a fine and license suspension. If the BrAC exceeds 0.25 mg/L, the offender is prosecuted by the District Prosecutors Office and subjected to criminal charges and imprisonment, criminal detention, or a high fine. Evidence has shown that Screening, Brief Intervention, and Referral to Treatment (SBIRT) is an effective approach for minimizing alcohol use problems and alcohol-related consequences, including DUI (Babor, Del Boca, & Bray, 2017). The joint TTDPO–TCH intervention program adopted the SBIRT model in accordance with the guidelines of the World Health Organization (Babor & Higgins-Biddle, 2001).

In this study, repeat offenders with one or more prior DUI convictions (i.e., BrAC ≥ 0.25 mg/L) were asked by prosecutors from the TTPDO to self-administer the Chinese version of the Alcohol Use Disorder Identification Test (AUDIT) (Chen, Chen, & Cheng, 2004). The AUDIT contains 10 items, with each item scored from 0 to 4. An AUDIT score of 8 or more indicates high sensitivity and specificity for detecting hazardous alcohol use (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). In the present study, those with an AUDIT score of ≥8, and who were willing to receive alcohol treatment were then referred to the Department of Addiction Sciences of the Taipei City Psychiatric Center (TCPC), of TCH. The other inclusion criteria were (1) an age 18 years or older, (2) residence in an area of Taipei City or New Taipei City where TCPC could be reached by public transport, (3) no criminal record other than DUI offenses, and (4) no involvement in any other DUI intervention programs. A total of 259 individuals gave informed consent and agreed to participate in the intervention program between April 2015 and December 2019. More than 20 prosecutors joined the program and mandated the offenders undergo alcohol treatment for either 6 or 12 months according to the prosecutors' comprehensive judgements.

2.2. Intervention

The alcohol treatment was outpatient based. Upon their first visit, each participant was screened for physical illnesses through biochemical tests. Those with possible physical problems were then referred for consultation with internal medicine physicians. In this study, in accordance with the SBIRT protocol, we offered each participant individualized treatment on the basis of their AUDIT score at baseline; this treatment has been detailed previously (Cheng et al., 2021). In brief, the treatment consisted of two weekly sessions followed by three biweekly sessions and then four monthly sessions, resulting in a 6-month treatment course. Those mandated to receive 12 months of treatment were required to attend three more bimonthly sessions. Each treatment session comprised two parts: a medical consultation conducted by addiction medicine psychiatrists (coauthors MCH, HMC, and HYT) and a brief intervention conducted by a case manager specializing in counselling psychology. The frequency of the intervention visits was increased if the offender's alcohol use problems were clinically judged to have worsened. If a participant failed to attend a scheduled intervention session, the case manager would call them by phone to arrange another appointment, given that judicial monitoring is an essential component in supporting recovery and promoting adherence to treatment among offenders (Voas & Fisher, 2001). In addition, the case managers would notify TTDPO probation officers of the unexcused absence so that the officers could further encourage the participant to comply with the program.

2.3. Measurement

At baseline, we collected multiple demographic characteristics of the participants, including age, sex, education level, employment status, and marital status. Laboratory panels for chronic alcohol consumption—namely aspartate-aminotransferase, alanine-aminotransferase, gamma-glutamyltransferase, and mean corpuscular volume—were measured by an automated system. The Time-line Follow-back methods was employed to measure baseline variables related to the participants' alcohol-drinking behaviors—namely their average alcohol consumption per day (one drink = 10 g of pure ethanol), number of drinking days per week, and number of heavy drinking (≥6 drinks) days per week—in the preceding 3 months. Additionally, the Cutting down, Annoyance by criticism, Guilty feeling, and Eye-openers (CAGE) questionnaire, a tool used to screen an individual's potential for alcohol use problems over their lifetime (Ewing, 1984; Wu et al., 2008), was administered. A CAGE score of two or more indicated high sensitivity and specificity for identifying alcohol dependence (do Amaral & Malbergier, 2008; Ewing, 1984). Alcohol craving was measured using a self-rated visual analog scale with a 10-point Likert-type scale ranging from 0 (no craving) to 9 (craving so severe that the individual was unable to resist a drink if one was available). Next, the self-administered 21-item Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961; Lu, Che, Chang, & Shen, 2002) and 21-item Beck Anxiety Inventory (Beck, Epstein, Brown, & Steer, 1988; Che, Lu, Chen, Chang, & Lee, 2006) were employed to evaluate depression and anxiety severity, respectively. The Chinese version of these two inventories, each with a summed score ranging from 0 to 63, has exhibited high internal consistency (Cronbach coefficients > 0.9) and high factor validity in Taiwanese populations (Che et al., 2006; Lu et al., 2002). Finally, the present participants also self-rated themselves using the Barratt Impulsiveness Scale (BIS) (Patton, Stanford, & Barratt, 1995), which consists of 30 items, each scored on a 4-point Likert scale. The BIS is one of the most extensively used self-reporting instrument to measure impulsiveness in both clinical samples and the general population. The Chinese version of the BIS has been validated previously and exhibited favorable reliability for use among substance users (Huang, Li, Fang, Wu, & Liao, 2013).

The primary outcome was a DUI reoffense event within 2 years after a participant's last treatment session. Because each participant provided written permission on their informed consent forms, we were permitted to access each participant's reoffense records (BrAC

≥ 0.15 mg/L) provided by the Taipei City Traffic Adjudication Office (TCTAO). To compare the reoffense rates of the participants in the 6- and 12-month groups with that of the nonintervention group, we obtained a cohort of 4,097 deidentified DUI offenders—namely offenders with BrAC ≥ 0.15 mg/L at the time of their offense, regardless of whether they were first-time or repeat offenders—from the TCTAO between January 2016 and December 2019. We analyzed their reoffense records for 2 years.

2.4. Statistical analysis

We compared the demographic characteristics, alcohol-drinking behavioral variables, and psychological symptoms of the participants who received 6-month treatment with those who received 12-month treatment. Differences observed were then tested using Student's *t* test for continuous variables and the chi-square test or Fisher's exact test (for observations < 5) for categorical variables.

A Cox proportional hazards model was used to determine the HR of the 12-month treatment group (reference: 6-month treatment group) for DUI recidivism. An HR for each characteristic was determined independently in both crude models and full models adjusted for all the other variables. We tested the validity of the proportional hazards assumption for each variable by using a Kolmogorov-type supremum test based on 1,000 simulated residual patterns (Austin, 2018). All variables met the proportional hazards assumption ($p > 0.05$). We then compared the survival curve for reoffense between the nonparticipant group (reference group) and the 6- and 12-month treatment groups by using log-rank tests. SAS 9.4 (SAS Institute, Cary, NC, USA) was used for all analyses, and significance was set to $p < 0.05$.

Table 1
Baseline characteristics of the two intervention groups (N = 259).

	One-year intervention group (n = 116)	6-month intervention group (n = 143)	*P-value*
Age (year), mean (SD)	45.7 (9.3)	47.6 (8.5)	0.087
Sex[a], n (%)			0.490
Male	113 (97.4)	141 (98.6)	
Female	3 (2.6)	2 (1.4)	
Education (year), mean (SD)	11.5 (3.8)	11 (3.45)	0.286
Marriage[b], n (%)			0.590
Unmarried	75 (64.7)	97 (67.8)	
Married	41 (35.3)	46 (32.2)	
Occupation[a], n (%)			0.324
Unemployed	6 (5.2)	4 (2.8)	
Employed	110 (94.8)	139 (97.2)	
Alcohol drinking variables			
CAGE[b], n (%)			0.798
<2	38 (32.8)	49 (34.3)	
≥2	78 (67.2)	94 (65.7)	
VAS for alcohol craving, mean (SD)	29.36 (25.5)	24.59 (23.87)	0.125
Heavy drinking days/week, mean (SD)	0.9 (1.2)	1.3 (2.3)	0.266
Drinking days/week, mean (SD)	2.4 (2.5)	2.3 (2.4)	0.756
Drinks/drinking day, mean (SD)	3.8 (4.3)	4.1 (5.1)	0.664
Biochemical data, mean (SD)			
ALT (10–39) (U/L)	37.4 (94.1)	32.9 (27.8)	0.618
AST (7–42) (U/L)	39.1 (62.9)	43.9 (48.7)	0.501
γ-GT (5–61) (U/L)	143.3 (206.1)	204.2 (396.4)	0.113
MCV (80–100) (fL)	91.5 (7.8)	91.1 (8.7)	0.720
Psychological Assessment			
BIS scores, mean (SD)	65.6 (9.8)	64 (9.4)	0.257
BDI scores, mean (SD)	9.1 (8)	8.6 (8.7)	0.625
BAI scores, mean (SD)	6.8 (8.5)	5 (6.5)	0.063
Treatment sessions attended	12 (0.7)	9.1 (0.9)	**<0.001**
Rearrested within 2 years after intervention[b], n (%)	14 (12.1)	27 (18.9)	0.135

[a]Fisher's exact test, [b]chi-square test.
Abbreviations: ALT: alanine transaminase; AST: aspartate transaminase; BAI: Beck Anxiety Inventory; BDI: Beck Depression Inventory; BIS: Barratt Impulsivity Scale; SD: standard deviation; γ-GT: gamma-glutamyl transferase; MCV: mean corpuscular volume; VAS: visual analogue scale.

3. Results

The participants were all middle aged and predominantly employed (Table 1). Of the 259 participants, 41 (15.8%) committed a DUI reoffense within the 2 years following the completion of 6- or 12-month treatment. According to the CAGE questionnaire responses, 66.4% of the participants had potential problems with alcohol dependence (score ≥2) at baseline. We observed no differences among the demographic characteristics, baseline psychological symptoms, or alcohol-drinking behaviors of the two treatment groups. All participants completed their scheduled sessions (i.e., 9 sessions for the 6-month treatment group and 12 sessions for the 12-month treatment group).

Fig. 1 presents the reoffense rates for the three groups after 6, 12, and 24 months of follow-up. The 2-year reoffense rates for the 12-month treatment, 6-month treatment, and nonintervention groups were 12%, 19%, and 21%, respectively. Chi-square tests with Bonferroni's correction for pairwise comparison showed that the 6-month treatment group exhibited a lower reoffense rate after 6 months of follow-up relative to the nonintervention group; however, their reoffense rate was not significantly different after 12 or 24 months of follow-up. The 12-month treatment group had lower reoffense rates compared to non-intervention group after 6-month, 1-year, and 2-years of follow-up.

The Cox proportional hazards model showed adjusted hazard ratio between the 6-month and 12-month treatment groups over the 2-year follow-up period (Table 2). We found that with the exception of the length of treatment (12 months vs. 6 months), none of the variables—including demographic characteristics, alcohol-drinking behaviors, and psychological symptoms—were associated with a risk of reoffense. Compared with the 6-month treatment group, the 12-month treatment group had a lower risk of reoffense within 2 years after adjustment for all variables (HR = 0.45, 95% confidence interval [CI] = 0.21–0.96, p = 0.037). The reoffense rates were18.9% and 12.1% (Fig. 1) in the 6 and 12-month treatment groups, respectively.

Fig. 2 presents the survival curves of the nonintervention group and 6- and 12-month treatment groups. The log-rank tests revealed significant differences among the three groups (p = 0.04). The HRs for the 6-month group after 6, 12, 18, and 24 months of follow-up were 0.51 (95% CI = 0.25–1.03), 0.71 (95% CI = 0.43–1.16), 0.8 (95% CI = 0.53–1.22), and 0.86 (95% CI = 0.58–1.26), respectively. The HRs for the 12-month group at the same follow-up time points were 0.23 (95% CI = 0.07–0.72), 0.42 (95% CI = 0.21–0.85), 0.52 (95% CI = 0.30–0.92), and 0.53 (95% CI = 0.31–0.90), respectively.

4. Discussion

This 2-year post-intervention follow-up study expanded on our previous findings (Cheng et al., 2021) by including a comparison group and increasing the follow-up period to 2 years. The results indicated potential benefits of the proposed joint legal–medical

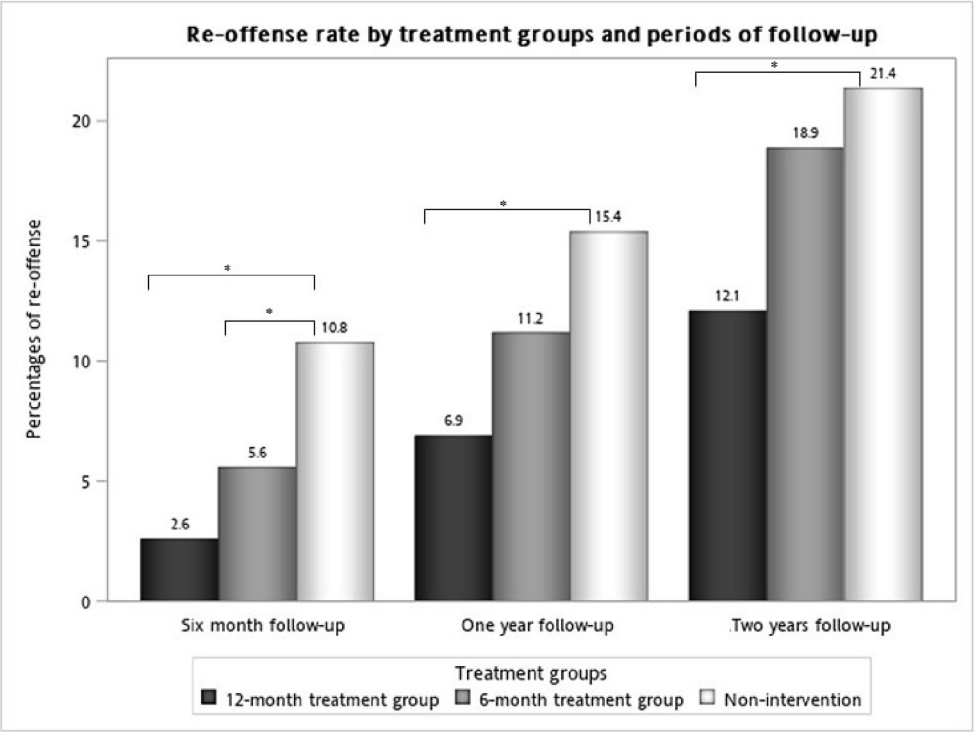

Fig. 1. Reoffense rates of the 12-month treatment group (black bar), 6-month treatment group (gray bar), and nonparticipant group (white bar) after 6, 12, and 24 months of follow-up; *p < 0.05.

Table 2
Hazard ratio (HR) for reoffense 2 years after intervention for the 12- and 6-month intervention groups (n = 259).

	Crude HR (95% CI)*	*P*	Adjusted HR (95% CI)**	*P*
Age (year)	1.01 (0.98–1.05)	0.49	1.02 (0.98–1.07)	0.35
Education (year)	0.96 (0.89–1.05)	0.382	1.03 (0.92–1.15)	0.637
Marriage state (ref: Married)	0.86 (0.45–1.62)	0.633	0.51 (0.22–1.2)	0.123
Alcohol drinking variables				
CAGE (ref < 2)	0.78 (0.42–1.46)	0.43	0.78 (0.38–1.63)	0.51
VAS for craving	1.01 (1–1.02)	0.161	1.01 (0.99–1.02)	0.389
Heavy drinking days/week	1.06 (0.92–1.21)	0.434	0.94 (0.77–1.16)	0.565
Drinking days/week	1.11 (0.99–1.25)	0.084	1.11 (0.92–1.35)	0.274
Drinks/drinking day	1.02 (0.96–1.08)	0.5	1.01 (0.93–1.1)	0.785
Psychological Assessment				
BIS scores	0.99 (0.96–1.03)	0.694	0.99 (0.95–1.03)	0.559
BDI scores	0.97 (0.93–1.02)	0.225	0.97 (0.92–1.03)	0.335
BAI scores	1.01 (0.98–1.05)	0.501	1.04 (0.98–1.1)	0.168
12-month intervention group (reference: 6-month intervention group)	0.62 (0.32–1.17)	0.14	**0.45 (0.21–0.96)**	**0.039**

*Crude models: Each independent variable was included in a separate model.
**Adjusted models: Adjusted for all the other variables listed in this table.
Abbreviations: BAI: Beck Anxiety Inventory; BDI: Beck Depression Inventory; BIS: Barratt Impulsivity Scale; CI: confidence interval; HR: hazard ratio; VAS: visual analog scale.

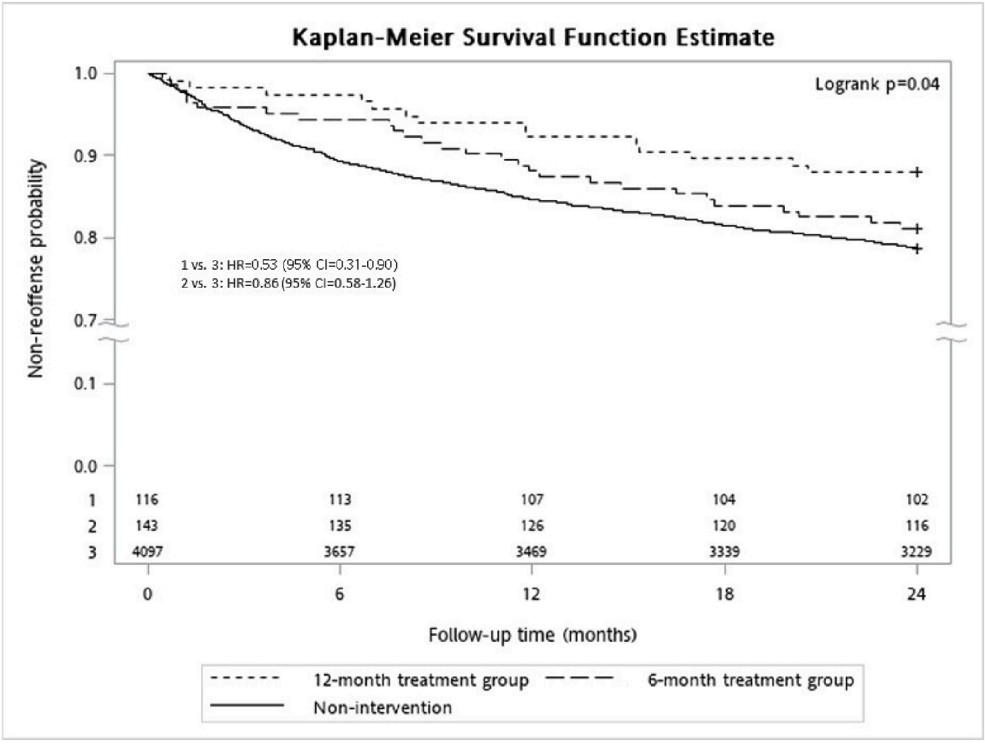

Fig. 2. Survival curves and HRs for reoffense within 2 years for the 12- and 6-month treatment groups and the non-intervention group (reference group).

intervention program in preventing DUI reoffense among repeat DUI offenders. The participants who received 12 or 6 months of intervention exhibited lower reoffense rates than did those who did not participate in the program after 6 months of postintervention follow-up. After 12 or 24 months of follow-up, a reduction in the reoffense rate was observed only in the 12-month intervention group, revealing an almost halved reoffense risk compared with that in the nonintervention group. In addition, in the Cox model, the 12-month intervention group exhibited a lower risk of DUI reoffense than did the 6-month group throughout the 2-year follow-up period.

Our finding that the longer treatment regimen (12 months) was more effective than the shorter treatment regimen (6 months) for reducing the long-term reoffense rate is consistent with our previous data, which indicated a negative correlation between treatment duration and 1-year reoffense risk and a lower risk for those receiving treatment for 4 months or longer than for those receiving treatment for up to 4 months (Cheng et al., 2021). Next, instead of conducting an intragroup comparison, this study compared program

participants with nonparticipants and thereby revealed more favorable and sustainable outcomes related to DUI risk reduction for up to 2 years, albeit only among those who received 12 months of treatment. Consistent with our observations, two review studies that investigated the effects of addiction treatment on individuals with alcohol or drug use disorders discovered that interventions lasting 12 months or longer yielded more favorable therapeutic outcome than did interventions lasting <12 months (McKay, 2005, 2009). Therefore, an adequate duration of treatment, such as 12 months, could be crucial for long-term DUI risk reduction in our joint program. Although offenders with AUD may learn strategies to avoid driving after drinking from short-term courses, they are at a high risk of hazardous drinking and impaired judgment if AUD is incompletely treated (Kouimtsidis, Duka, Palmer, & Lingford-Hughes, 2019).

The lack of benefit from 6-month treatment can be explained by two factors. First, the nonintervention group in our study contained a mixture of offenders, including all offenders with BrAC $\geq$ 0.15 mg/L regardless of whether they were first-time or repeat offenders or whether they had AUD. Previous evidence has revealed that first-time offenders account for approximately two-thirds of all DUI offenders (Dickson et al., 2013) and are less likely to engage in DUI recidivism than are repeat offenders (Rauch et al., 2010). As such, in the present study, compared with the intervention group, which comprised repeat offenders with BrAC $\geq$ 0.25 mg/L at the time of offense and with coexisting AUD, our nonintervention group represented a population with a relatively low risk of reoffense. Thus, differences between the treatment group and non-intervention groups may have been underestimated; that is, the reality may have been a lack of significant risk reduction in the 6-month intervention group. Second, a longer treatment may be required to ensure sustained behavioral changes due to the development of intrinsic motivation. In individuals with AUD, a longer treatment is associated with more favorable alcohol-related outcomes (Moos & Moos, 2003). Studies have proposed that a treatment of 12 months is required to achieve sufficient stability in recovery from AUD (Hagman et al., 2022). Therefore, we speculate that a more prolonged period of therapeutic contact may yield a more pronounced effect on individuals' behavioral changes.

Repeat DUI offenders in the non-intervention group exhibited a recidivism rate of 21% within 2 years, which was higher than the 12% for those receiving 12 months of treatment. Directly comparing our data with those of other studies would be difficult because the study participants (e.g., the proportion of participants with coexisting AUD), the case numbers, the length of the follow-up, the post- and during-intervention measurement of DUI events, and the treatments vary across studies. For example, a 3-year follow-up study with a similar postintervention follow-up design involving a four-session motivational enhancement therapy course for first-time DUI offenders revealed recidivism rates of 21% for intervention participants and 29% for the nonintervention group (Robertson et al., 2009); however, only 16% of those study participants were identified as problem drinkers. Another 12-hour educational program (either a traditional DUI curriculum or a Preventing Alcohol-Related Convictions curriculum) revealed a 2-year recidivism rate of only 3% among treated participants who were first-time offenders (Rider, Voas, Kelley-Baker, Grosz, & Murphy, 2007). In an intensive court-based supervision program for repeat DUI offenders, the 3-year recidivism rates were 10% for the program participants and 18% for the nonparticipants (Lapham et al., 2006); however, these figures are rates estimated during treatment rather than after it.

A number of individual factors may influence the risk of recidivism, including male sex, middle age, individual residency, low education level, and AUD or anxiety symptoms (Cavaiola et al., 2007; Cheng et al., 2021; Dickson et al., 2013). However, this study observed no associations of demographic characteristics or psychological symptoms with 2-year reoffense risk (Table 2). Previous evidence has demonstrated that those who complete treatment programs generally have more favorable outcomes than do those who do not complete such programs (Beadnell et al., 2015; Robertson et al., 2009), indicating that intervention compliance is a crucial factor in reducing the risk of recidivism (Robertson et al., 2016; Voas & Fisher, 2001). The participants in this study underwent regular monitoring from the judicial system and all completed their treatment. Therefore, our sample represents a group of specially selected homogenous participants who shared similar clinical profiles. This factor might help explain the fact that no variables predicting reoffense within 2 years were identified. Nevertheless, we did not measure some factors that may also affect the reoffense risk, such as motivation level, readiness to change, personality traits, and familial support. Whether these factors play a role should be determined in subsequent studies.

The main strength of this study is that it followed participants for up to 2 years and that it employed objective official records as opposed to verbal reports to define reoffense. Unlike other studies that have analyzed DUI offenders, we focused on repeat DUI offenders with AUD as well as treatment for alcohol-related problems in community-based clinical settings. In addition, the treatment in this program was longer than those in most other programs for DUI offenders. Nevertheless, some limitations of this study must be addressed. First, the participants were not randomly assigned, and the research team had no say in treatment group allocation, which was performed by the prosecutors. A randomized controlled trial is thus needed to determine the exact effect of intervention duration on recidivism rate. Second, although we obtained data for demographic characteristics, psychological symptoms, and alcohol-drinking behaviors for the participants in the two intervention groups, we could not control for the effects of unmeasured variables, and this deficiency may have led to bias in our results. In addition, the nonintervention group comprised a mixture of deidentified first-time and repeat DUI offenders, and thus we were unable to distinguish each offender's offense record in terms of first-time versus repeat DUI violations; therefore, we were unable to obtain precisely estimated HRs in the survival analysis by comparing the offense rates of the repeat offenders in the intervention and nonintervention groups (Fig. 2). The third limitation was that the study population did not enable us to generalize our findings to other individuals who were not included in this study, such as first-time offenders, those with criminal histories or illicit substance misuse, and those without alcohol-related problems. Finally, we noticed that the treatment effect of DUI risk reduction gradually weakened over 2 years; therefore, whether the effect of this joint program could be sustained over longer periods must be explored in subsequent investigations.

In conclusion, legal sanctions for DUI cases have increasingly included rehabilitation approaches in the form of alcohol treatment to counteract DUI (Voas, DuPont, Talpins, & Shea, 2011). By examining the potential benefit of a newly established joint legal–medical intervention program focusing on alcohol treatment as a diversion from legal sanctions (e.g., prosecution or imprisonment), our study

revealed that 12-month of treatment reduced the recidivism rate within 2 years after intervention compared with 6-month treatment for repeat DUI repeat offenders with alcohol-drinking problems. Future studies are required to identify other types of DUI offenders on the basis of other individual characteristics and other alcohol-drinking behaviors in order to develop tailored intervention programs.

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Contributors

MC Huang contributed to the conception and design of this study, interpretation of the results, and revision of the manuscript. SC Fang contributed to the analysis and interpretation of data. HM Chang, HY Tu, and YT Chang contributed to data collection. TW Yang provided critical comments on the study design. WJ Chen drafted the first draft paper and incorporated all the edits. All the authors provided major revisions and approved the final manuscript.

Declaration of Competing Interest

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

Data availability

The data underlying this article cannot be shared publicly due to the privacy of individuals that participated in the study. The data will be shared on reasonable request to the corresponding author.

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