

Predictors of retention in the ‘voluntary’ and ‘quasi-compulsory’ treatment of substance dependence in Europe

Michael Schaub^a, Alex Stevens^b, Severin Haug^a, Daniele Berto^c, Neil Hunt^b, Viktoria Kerschl^d, Tim McSweeney^e, Kerrie Oeuvray^f, Irene Puppo^g, Alberto Santa Maria^h, Barbara Trinklⁱ, Wolfgang Werdenichⁱ, Ambros Uchtenhagen^a

^a Research Institute for Public Health and Addiction, Zurich, Switzerland; ^b European Institute of Social Services, University of Kent, Canterbury, UK; ^c Servizio Tossicodipendenza, Padova, Italy; ^d SPI Forschung, Berlin, Germany; ^e Institute for Criminal Policy Research, King’s College London, London, UK; ^f University of Fribourg, Fribourg, Switzerland; ^g Servizio Tossicodipendenze, Firenze, Italy; ^h Servizio Tossicodipendenze, Bari, Italy; ⁱ Lehr- und Forschungspraxis der Universität Wien, Vienna, Austria

Conflicts of interest:

None.

This study has been funded by the European Commission (contract number QLG4-CT-2002-01446).

Keywords: Predictors; coercion treatment; compulsory treatment; substance use

Corresponding author:

Michael Schaub, PhD

Research Institute for Public Health and Addiction

Konradstrasse 32, 8031 Zurich, Switzerland

Phone: +41 44 448 11 65

Fax: +41 44 448 11 71

Email: michael.schaub@isgf.uzh.ch

Predictors of retention in the ‘voluntary’ and ‘quasi-compulsory’ treatment of substance dependence in Europe

Keywords: Predictors; coercion treatment; compulsory treatment; substance use

Abstract

Background Policies and practices related to the quasi-compulsory treatment (QCT) of substance-dependent offenders are currently implemented in many countries, despite the absence of reliable knowledge about significant predictors of treatment retention. This study aimed to identify such predictors in QCT and voluntary treatment.

Methods Participants were treated in one of 65 institutions in 5 European countries. They were interviewed at intake on substance use, committed crimes, perceived pressure for treatment, self-efficacy, stage of change, employment, and health-related variables. Binary logistic regression models were computed to identify predictors of treatment retention at an 18-month follow-up. Moderator analyses were computed to investigate whether these predictors vary by treatment condition (quasi-compulsory vs. voluntary).

Results A higher number of working days in the previous month was positively associated with treatment retention, while use of heroin, crack, and multiple drugs, psychiatric problems in the previous month, and lifetime depression were negatively associated with treatment retention. Higher perceived medical pressure resulted in higher treatment retention rates only for participants in QCT.

Conclusion Predictors of substance abuse treatment retention are quite similar across both the quasi-compulsory and voluntary treatments. Perceived medical pressure is of higher relevance than the often-believed legal pressure for treatment retention in QCT.

Introduction

There is an increasing interest in the use of criminal justice systems to direct drug-related offenders into treatment that potentially reduces harm [1-2], is cost-effective [1, 3], and relieves overloaded prisons [2-3]. In a recent study, we demonstrated that treatment of such offenders reduces substance use and crime and improves health and social integration similarly to voluntary treatment [4]. However, at present, only a few substance-dependence treatment programmes for prisoners are available (e.g., substitution therapy or naltrexone prescription [1, 5]). Those available are often limited to emergency cases, and implementation varies between European and U.S. prisons [6]. The literature shows that a majority of substance-dependent inmates resume drug use and criminal activities after release into the community [3, 6]. Providing treatment services to substance-dependent offenders in a non-prison-related institution is therefore a useful alternative to incarceration [1, 6-7].

We define quasi-compulsory treatment (QCT) as substance abuse/dependence therapy that is motivated, ordered, or supervised by the criminal justice system but that takes place outside of prisons. Other forms of compulsory treatment as regulated by social care and mental health laws are excluded from this definition. Arrangements for QCT differ among the various European countries and the many U.S. drug court policies; European programmes are not limited to drug offenders and are often used for persistent offenders who would be excluded from several of the American drug court systems [8].

Generally, the literature suggests that QCT is at least as effective as voluntary treatment in reducing substance use and crime [1, 8-9]. Furthermore, legal compulsion is believed to improve retention in treatment [6, 10]. However, we must emphasise that a large proportion of research that compares QCT to voluntary treatment for substance users is non-empirical in nature [8]. Additionally, a majority of empirical studies fail to use adequate comparison groups, and those that do generally fail to differentiate among primary substances of abuse and employ rather short follow-up periods [6]. Moreover, recent U.S. studies argue that results must be viewed in terms of very complex, specific criminal justice treatment delivery systems [8, 11] and their unique organisational contexts [12].

Thus far, little attention has been paid to the effects of baseline variables in predicting the retention of QCT; in particular, there have not been adequate comparisons to voluntary treatment. The current knowledge on the predictors of retention in QCT is based only on the few studies detailed below.

Substance use and criminality

There exists no clear relationship between substance use and criminality, if there is any relationship at all [13]. However, there is more evidence for a relationship between illegal substance misuse/abuse and criminality, although the explanations for and direction of this link are not clear [14-16]. Pertaining to predictors of treatment retention, social conformity and the experience of either gunshots or stabbing predicts at intake retention in an alternative non-prison residential drug treatment programme [17]. In a more recent study, lengthier criminal histories at intake predict treatment drop-outs among court-mandated substance-abusing offenders [18].

Perceived pressure and coercion

Research on legally coerced drug treatment is ongoing, with mixed results reported internationally [1, 6-8]. It has been suggested that people who are coerced into drug treatment will not be motivated to change [19] and may therefore be less likely to engage and succeed in treatment [20]. Some studies argue that motivation is a good predictor of retention in the treatment of drug dependence [11, 21-22], although others suggest that motivation is less important than factors such as therapeutic alliance and their perceived utility [23].

It is important to distinguish between the various sources of perceived coercion (e.g., coercion from legal authorities, family, or an employer), as it is likely that different forms of coercion produce different treatment outcomes and retention rates [6]. Previous research combining different measures of coercion has produced some interesting results. For example, an American study in three inpatient therapeutic communities found that the perceived legal pressure predicts better retention, while pressure from families predicts worse retention [24]. Stevens et al. [25] suggested that participants entering QCT perceive more pressure, but this does not necessarily lead to higher or lower motivation than under voluntary treatment. They believe that motivation is mutable and that it can be enhanced or diminished by the quality of support and services in QCT.

Psychiatric disorders

There are two U.S. studies that report on predictors for treatment retention and drop-out. In the first, the existence of a psychiatric history predicts the completion of treatment at intake in

an alternative non-prison residential drug treatment programme [17]. In the second study, more severe psychiatric problems at intake predict treatment drop-outs among court-mandated, substance-abusing offenders [18].

Employment status

According to a large study on retention data investigating deterrents against the premature termination of treatment in offenders referred to long-term residential treatment, the lack of legitimate job opportunities acts as a deterrent, similar to criminal sanctions against drug offenses [26]. In a study by Evens and Hser [18], more severe employment problems at intake predicted treatment drop-outs in court-mandated, substance-abusing offenders. In another study, the strongest predictors of success in court-mandated SUD treatment were factors associated with social stakeholder values, especially those involving employment [27].

Self-efficacy

In methadone-maintained patients undergoing voluntary treatment, higher levels of self-efficacy at intake are related to lower drug use after 12 months [28] and to more frequent cocaine-negative urine samples [29]. So far, no studies have reported on self-efficacy as a potential predictor on treatment retention in both voluntary and coerced SUD treatment.

Motivation

Substance users differ in the extent to which they are motivated to change, become therapeutically engaged in treatment, or sustain recovery following treatment [30]. Treatment motivation has not been found to be significantly different between individuals in a substance use, prison-based treatment programme for legal and illegal substances versus individuals in the general prison population [31]. In the study by Evans and Hser [18], lower treatment motivation at intake predicts treatment drop-outs in their population of court-mandated, substance-abusing offenders.

The current study investigated predictors and moderators of retention in QCT and voluntary treatment. Predictors specify which individuals are likely to have better treatment retention irrespective of compulsive or voluntary admission. Moderators specify whether there are

differences in the predictors of treatment retention due to quasi-compulsive or voluntary admission.

Methods

Services and participant selection

Services from the United Kingdom, Italy, Austria, Germany, and Switzerland were selected if they treated participants eligible for either QCT or voluntary groups [4, 25]. The QCT group was defined as participants receiving treatment on court order (i.e., having or awaiting a court sentence for QCT) as an optional alternative to imprisonment or other punishment in a regular inpatient or outpatient treatment institution. The voluntary group was defined as persons entering treatment institutions in which QCT was also available. A total of 65 treatment institutions that recruited participants for both QCT and voluntary groups were included in this study. Within these institutions, a total of 430 QCT and 415 voluntary treatment participants were recruited.

Inpatient treatment almost exclusively included abstinence-oriented drug addiction treatment after detoxification. Participants in outpatient treatment with opiate addiction were predominantly treated in substitution programmes. In the voluntary group, treatment length was dependent on treatment concepts (i.e., inpatient) or individual decisions (i.e., outpatient). There were no differences in the treatment concepts for participants in the QCT and voluntary groups within the institutions; both groups received essentially the same treatment. QCT participants were more often assigned to inpatient treatment than voluntary participants (50.1% vs. 34.7%, $p<.01$). The mean expected treatment duration was 410.9 days (SD=192.6). Non-compliance in the QCT group was dependent on regulations in the respective countries; therefore, QCT participants failing treatment were at risk of being sentenced to prison in most countries. Out of 65 institutions, 42 (primarily larger institutions) filled out the Treatment Unit Form (TUF) [32]. According to the TUF, all responding institutions provided individual treatment planning. Job assistance was provided in 90% of the institutions, vocational training in 85%, housing assistance in 80%, financial assistance in 81%, and aftercare in 90%. Relapse prevention was provided in 83% of the institutions. On average, 25.9 hours (SD=25.4) of group therapy and group counselling were provided per month. Individual therapy and counselling were provided on average for 4.9 hours (SD=3.4) per month.

Participants in the QCT group were enrolled in the study at intake and provided informed consent for participation and for the use of their medical and police records. All participants were asked at intake by service staff to provide informed consent, were assured that all information would be handled confidentially, and were informed that they had the right to withdraw at any time without consequence to their treatment and/or court sentence (if applicable). The study protocol was approved by national or local ethics committees, as appropriate. All participants were exponentially paid between 10 and 20 Euros per follow-up interview to promote retention in the study. Detailed outcomes of the follow-up study will be published elsewhere.

Measures and data collection

We used the ASI-crime module (ASI-C) [33] and the European Addiction Severity Index (EuropASI) [34], with items omitted that are not on the ‘critical objective EuropASI items’ list [35] to reduce the time needed to administer the instrument. Institutions were instructed to verify patient self-reports in the EuropASI by comparing urine analyses with reported urine test results from patient case histories. Moreover, we used Hiller et al.’s [10] initial assessment form for correctional inpatient treatment to assess to what extent respondents felt pressured by various sources. We also used an adapted version of the Proactive Coping Scale [36] and the Readiness-to-Change Questionnaire (RCQ) [37]. The RCQ was used to assign respondents to different stages of Prochaska and Diclemente’s stages of change model [38] (i.e., the precontemplation, contemplation, or action stage). For this study, the precontemplation and contemplation stages were collapsed to obtain a dichotomous variable for predictor and moderator analyses. Although the concept of stages of change has been criticised [39], there is a wide consensus that people who state that they are willing to stop using drugs are more likely to succeed than those who do not [40]. All of these measures were used at intake as well as at 6-, 12-, and 18-month follow-up interviews. Intake interviews were administered after detoxification (i.e., abstinence-oriented treatments) or appropriate stabilisation (i.e., substitution treatments). None of the participants were prescribed antagonist treatment. Interview guidelines and questionnaires unavailable in the required languages were translated with back translations. Participant interviews were completed face-to-face with external interviewers who were not from the treatment institutions but rather were trained in the use of the EuropASI.

To assess reasons for treatment drop-out relevant to the current investigation, information was collected immediately after drop-out from a patient's therapeutic and/or legal contact along with medical and police records.

Definition of retention

Participants were subdivided into (1) a group with treatment retention, (2) a group without treatment retention, and (3) a group with ambiguous treatment retention. Participants were assigned to the group with treatment retention if they (1) completed planned treatment, (2) remained in, or (3) re-entered treatment. Participants were assigned to the group without treatment retention if they were (1) (re-)arrested, (2) excluded from treatment service, (3) died within 18 months after intake, (4) chose to leave (i.e., participants who left treatment without a subsequent treatment and/or further treatment within 18 months and who were not included in one of the other categories), or (5) had the QCT revoked by the court (i.e., participants whose QCT arrangement was revoked and who did not re-enter treatment within 18 months). Participants were assigned to the group with ambiguous treatment retention if (1) they moved abroad, (2) they revoked informed consent, (3) they were repatriated, or (4) their data records were ambiguous, insufficient, or missing.

Statistical analyses

Intake differences between the QCT and voluntary groups were analysed using χ^2 -statistics for categorical variables and adjusted Wald test statistics for continuous variables. Given the clustered nature of the data (i.e., participants within treatment institutions), the χ^2 -statistics were corrected for the clustered design and then converted into F statistics. We calculated effect sizes for intake variables, which differed significantly between the QCT and voluntary groups. Cohen's *d* (0.2 = small effect, 0.5 = medium effect, 0.8 = large effect) was calculated for continuous variables; *w* (0.1 = small effect, 0.3 = medium effect, 0.5 = large effect) was calculated for categorical variables.

Binary logistic regression analyses were computed to explore the predictors and moderators of treatment retention compared to the reference group without treatment retention.

Participants with ambiguous retention were not considered in the predictor and moderator analyses. Separate logistic regressions were performed to evaluate the ability of each intake variable to predict treatment retention, regardless of compulsory or voluntary admission.

After examining these univariate predictors, a multivariate prediction model was developed. Variable selection involved the following steps. (1) Significant predictors ($p < .05$) from the univariate analyses were entered into the preliminary multivariate model. (2) Variables not significant at $p < .05$ were removed one by one; variables with the highest p -values were removed first (i.e., backward selection). (3) To account for suppressor effects, the resulting model was verified by tentatively adding the aforementioned excluded variables separately to the regression model. Only variables significant at $p < .05$ were retained in the model (i.e., forward selection).

Statistical analyses of moderators were performed following the guidelines of Kraemer et al. [41] for evaluating moderators of treatment effects. Dichotomous intake variables (including QCT versus voluntary treatment) were coded as 0.5 or -0.5, and continuous intake variables were centred at their mean. The logistic regression models to test the moderators included the treatment group (i.e., QCT versus voluntary treatment) by intake variable interaction while controlling for the main effects of both the treatment group and intake variable. Significant moderator effects ($p < .05$) were graphically illustrated by plotting the retention rates for different values of the moderator according to the treatment group.

Due to the clustering of participants within treatment groups, we computed robust variance estimators for all logistic regression models. All analyses were performed using Stata version 10, and an alpha level of 0.05 (two-tailed) was chosen for the statistical tests.

Results

Intake descriptions

Participant intake characteristics for the QCT and voluntary groups are shown in Table 1. There was a higher proportion of male participants in the QCT group (86.1%) than in the voluntary group (77.4%, $p = .01$, effect size $w = 0.11$). Furthermore, the QCT and voluntary groups differed in terms of the number of years of school education, with a higher educational level in the voluntary group (10.1 years, QCT group 9.6 years, $p = .01$, $d = 0.21$). Concerning substance use, there was a lower percentage of crack users in the voluntary group (11.4%, QCT group 28.3%, $p = .00$, $w = 0.21$), but participants in the voluntary group had more years of excessive alcohol use (4.5 years, QCT group 3.1 years, $p = .04$, $d = 0.20$). Ninety percent of the participants in the QCT group had committed at least one high-severity crime at some point (e.g., burglary, firearm-related offences, or other weapons offences). The percentage of high-

severity crimes was lower in the voluntary group (70.2%, $p=.00$, $w=0.25$). Participants in the QCT group perceived more pressure from legal authorities (QCT group 2.9, voluntary group 1.4, $p=.00$, $d=1.19$) but less from families and/or friends (QCT group 2.1, voluntary group 2.3, $p=.01$, $d=0.17$) and from themselves (QCT group 3.5, voluntary group 3.8, $p=.00$, $d=0.19$). Self-efficacy was slightly higher in the QCT group (3.4) than in the voluntary group (3.3, $p=.04$, $d=0.17$), but there was no difference in the percentage of participants in the action stage of change between the groups. The longest period of unemployment was higher in the QCT group (4.7 years) than in the voluntary group (3.2 years, $p=.00$, $d=0.32$). The number of days listed as sick in the previous month was higher in the voluntary group (5.5 days, QCT group 2.9 days, $p=.01$, $d=0.27$). There were no differences between the groups in terms of the percentage of medical care used in the previous six months or in the prevalence of various psychiatric problems (see Table 1).

Treatment retention

Of the 845 participants, 449 (53.1%) were categorised into the group with treatment retention, while 257 (30.4%) were categorised into the group without treatment retention; for 139 participants (16.4%), data concerning treatment retention were missing or ambiguous. Using data from the 706 participants with unambiguous data for treatment retention, we did not find differences in treatment retention between the QCT and voluntary groups (retention: QCT group 67.8%, voluntary group 59.4%, $F=2.21$, $p=.15$).

Predictors of treatment retention – univariate analyses

Univariate predictors of treatment retention are shown in Table 2. A higher age (OR=1.03, CI 1.00-1.05) and a higher number of working days in the previous month (OR=1.03, CI 1.01-1.06) were positively associated with treatment retention. Heroin use in the previous month (OR=0.60, CI 0.37-0.97), crack use in the previous month (OR=0.48, CI 0.26-0.87), multiple drug use in the previous month (OR=0.41, CI 0.24-0.68), serious psychiatric problems in the previous month (OR=0.65, CI 0.47-0.92), and serious lifetime depression (OR=0.71, CI 0.52-0.96) were negatively associated with treatment retention.

Predictors of treatment retention – multivariate analysis

The final multivariate regression model predicting treatment retention included the variables multiple drug use in the previous month, which was negatively associated with retention

(OR=0.45, CI 0.28-0.70, $p<.01$), and the number of working days in the previous month, which was positively associated with retention (OR=1.03, CI 1.00-1.06, $p=.04$).

Variables moderating the effect of treatment condition on treatment retention

The moderator analyses revealed that medical pressure moderated the effect of compulsory versus voluntary admission on treatment retention (OR=0.70, 95% CI 0.51-0.95, $p=.05$). Higher perceived medical pressure resulted in higher treatment retention rates only for participants in the QCT group, while comparable retention rates were achieved for participants with high and low levels of perceived medical pressure in the voluntary group (Figure 1). Furthermore, multiple drug use moderated the effect of compulsory versus voluntary admission on treatment retention (OR=1.98, 95% CI 1.44-2.71, $p<.01$). Multiple drug use had a significantly stronger effect leading to lower treatment retention rates for participants in the QCT group compared to participants in the voluntary group. However, multiple drug use resulted in lower rates of treatment retention for both the QCT and voluntary groups (Figure 2). No moderating effect was found in the other intake variables, especially not for perceived pressure from the legal system ($p>.05$).

Discussion

The strength of the current study is in the prospective data and the results based on an extensive number of individuals undergoing QCT and voluntary treatment from various institutions within 5 European countries over a period of 18 months. The study revealed three main results. First, predictors of treatment retention were quite similar under both quasi-compulsory and voluntary treatment. Second, a number of intake characteristics predicted treatment retention in both groups, with multiple drug use and the number of working days in the previous month as the best predictors. Third, perceived pressure from legal authorities at intake did not moderate retention in the QCT group in contrast to voluntary treatment, whereas perceived medical pressure was a relevant moderator.

The first main result has a number of implications, of which we now discuss only a few. First of all, together with the comparison of treatment outcomes in an earlier publication [4], this finding supports QCT as an effective alternative to imprisonment for drug-related offenders.

Typically, the majority of substance-dependent prison inmates resume drug use and criminal activities after release into the community [6].

The presence of heroin, crack, and multiple drug use in the previous month was negatively associated with treatment retention. Interestingly, multiple drug use had a stronger negative effect on treatment retention for participants in the QCT group, but crack use did not have a negative moderating effect on treatment retention in this group. According to post hoc analyses, this might result from a confounding admission effect. Subjects in the QCT group were more often assigned to inpatient treatment, and this could have specifically retained crack users in treatment who frequently demonstrate severe craving symptoms in the first weeks of abstinence, symptoms that can persist for months.

In line with previous studies suggesting that employment is associated with better treatment retention [18, 27], a higher number of working days in the previous month was positively associated with treatment retention in both the univariate and multivariate analyses. This underscores the importance of employment for quasi-compulsory and voluntary treatment, although this result is expected to be confounded, as those who had employment before intake are likely the ones with less severe characteristics.

The third main finding highlights the importance of distinguishing among the various sources of perceived coercion [25] for participants in QCT versus voluntary treatment. Furthermore, this finding contradicts the often-reported belief that legal compulsion improves treatment retention [6, 20], which is based mainly on empirical studies that fail to use adequate comparison groups or employ rather short follow-up periods [6, 8]. However, we could not confirm perceived family pressure as a relevant, negative predictor in a study on three U.S. therapeutic communities [24].

The presence of at least one high-severity crime committed over the course of a patient's lifetime did not (negatively) predict treatment retention and did not moderate treatment retention with respect to quasi-compulsory or voluntary admission, although the presence of such a history was more prevalent in the QCT group. Consequently, QCT should not be restricted to offenders who committed typical substance abuse-related crimes such as drug trafficking, prostitution, and so on, as is common in several of the American drug court systems [8].

In line with Evans and Hser [18], serious psychiatric problems in the previous month and serious lifetime depression were negatively associated with treatment retention. No predictive relevance was found for the action stage of change. This finding supports existing critiques of the concept of stages of change [39]. Self-efficacy did not predict treatment retention, as we had expected based on its predictive results on substance use outcomes in methadone-maintained patients under voluntary treatment [28, 29]. However, due to the diverse sample consisting of heroin, cocaine/crack, multiple drug and alcohol abusers, it was not possible to calculate reliable predictors on treatment outcomes, which would have been a more accurate test for the potential corroboration of these previous results.

A limitation of the current study relates to the self-reported nature of the frequencies of substance use and crime. Urine analyses could not be systematically collected due to funding limitations. However, institutions were instructed to verify and correct participant self-reports on substance use and crime measures in the baseline EuropASI interviews based on reported urine test results from patient case histories. An additional limitation was that applied treatment methods differed among the institutions involved, although participants in the QCT and voluntary groups were for the most part treated in the same institutions using the same treatment concepts. Approximately one-third of each group was still in treatment after 18 months; thus, the predictor calculations are not based on final outcomes, which is a clear limitation in our study. However, we expected only a small portion of the participants still in treatment after 18 months to later demonstrate a negative outcome or revocation or to leave treatment without a follow-up treatment because most of these outcome events occurred in the first six months of this study.

In view of the current study's results, we conclude that predictors of treatment retention were generally quite similar under both quasi-compulsory and voluntary treatment. More specifically, perceived medical pressure was of higher relevance than the often-believed legal pressure for predicting treatment retention in quasi-compulsory treatment.

Acknowledgements

The authors wish to thank all staff from participating treatment services, without whose active support QCT Europe would not have been possible. Funding for QCT Europe was provided by the European Commission (contract number QL4-CT-2002-01446).

References

1. Perry AE, Darwin Z, Godfrey C, McDougall C, Lunn J, Glanville J, Coulton S: The effectiveness of interventions for drug-using offenders in the courts, secure establishments and the community: a systematic review. *Subst Use Misuse* 2009;44:374–400.
2. Sullivan MA, Birkmayer F, Boyarsky BK, Frances RJ, Fromson JA, Galanter M, Levin FR, Lewis C, Nace EP, Suchinsky RT, Tamerin JS, Tolliver B, Westermeyer J: Voluntary treatment: Uses of coercion in addiction treatment: clinical aspects. *Am J Addictions* 2008;17:36–47.
3. Kothari G, Marsden J, Strang J: Opportunities and obstacles for effective treatment of drug misusers in the criminal justice system in England and Wales. *Brit J Criminol*, 42, 412–432.
4. Schaub M, Stevens A, Berto D, Hunt N, Kerschl V, McSweeney T, Oeuvray K, Puppo I, Santa Maria A, Trinkl B, Werdenich W, Uchtenhagen A: Comparing outcomes of 'voluntary' and 'quasi-compulsory' treatment of substance dependence in Europe. *Eur Addict Res* 2010;16:53–60.
5. Chandler RK, Fletcher BW, Volkow ND: Treating drug abuse and addiction in the criminal justice system: improving public health and safety. *JAMA* 2009;301:183–190.
6. Klag S, O'Callaghan F, Creed P: The Use of Legal Coercion in the Treatment of Substance Abusers: An Overview and Critical Analysis of Thirty Years of Research. *Subst Use Misuse* 2005;40:1777–1795.
7. Wild TC: Social control and coercion in addiction treatment: Towards evidence-based policy and practice. *Addiction* 2006;101:40–49.
8. Stevens A, Berto D, Heckmann W, Kerschl V, Oeuvray K, van Ooyen M, Steffan E, Uchtenhagen A: Quasi-compulsory treatment of drug dependent offenders: an international literature review. *Subst Use Misuse* 2005;40:269–283.
9. Lurigio AJ: Drug treatment availability and effectiveness - Studies of the general and criminal justice populations. *Crim Justice Behav* 2000;27:495–528.

10. Leukefeld CG, Tims FM: Compulsory treatment for drug abuse. *Int J Addict* 1990;25:621–640.
11. Hiller ML, Narevic E, Webster JM, Rosen P, Staton M, Leukefeld C, Garrity TF, Kayo R: Problem severity and motivation for treatment in incarcerated substance abusers. *Subst Use Misuse* 2009;44:28–41.
12. Taxman FS, Henderson C E, Belenko S: Organizational context, systems change, and adopting treatment delivery systems in the criminal justice system. *Drug Alcohol Depend* 2009;103S:1–6.
13. White HR. Gorman DM.: Dynamics of the drug crime relationship *Criminal justice* 2000 vol I. The nature of crime: continuity and change. Washington DC: US Department of Justice, pp 151–218.
14. McCarty D, Chandler RK: Understanding the importance of organizational and system variables on addiction treatment services within criminal justice settings. *Drug Alcohol Depend* 2009;103S:91–93.
15. Sinha R, Easton C: Substance abuse and criminality. *J Am Acad Psychiatry* 1999;27:513–526.
16. Deitch D, Koutsenok I, Ruiz A: The relationship between crime and drugs: What we have learned in recent decades. *J Psychoactive Drugs* 2000;32:391–397.
17. Lang MA, Belenko S: Predicting retention in a residential drug treatment alternative to prison program. *J Subst Abuse Treat.* 2000;19:145–160.
18. Evans E, Li L, Hser YI: Client and program factors associated with dropout from court mandated drug treatment. *Eval Program Plann* 2009;32:204–212
19. Seddon T: Explaining the drug-crime link: Theoretical, policy and research issues. *J Soc Policy* 2000;29:95–107.
20. Cahill MA, Adinoff B, Hosig H, Muller K, Pulliam C: Motivation for treatment preceding and following a substance abuse program. *Addict Behav* 2003;28:67–79.

21. DiClemente C, Bellino L, Neavins T: Motivation for change and alcoholism treatment. *Alcohol Res Health* 1999;23:86–92.
22. Fiorentine R, Nakashima J, Anglin MD: Client engagement with drug treatment. *J Subst Abuse Treat* 1999;17:199–206.
23. Adamson SJ, Sellman JD, Frampton CM: Patient predictors of alcohol treatment outcome: a systematic review. *J Subst Abuse Treat* 2009;36:75–86.
24. Maxwell SR: Sanction threats in court-ordered programs: examining their effects on offenders mandated into drug treatment. *Crime Delinq* 2000;46:542–563.
25. Stevens A, Berto D, Frick U, Hunt N, Kerschl V, McSweeney T, Oeuvray K, Puppo I, Santa Maria A, Schaaf S, Trinkl B, Uchtenhagen A, Werdenich W: The Relationship between Legal Status, Perceived Pressure and Motivation in Treatment for Drug Dependence: Results from a European Study of Quasi-Compulsory Treatment. *Eur Addict Res* 2006;12:197–209.
26. Sung HE, Richter L: Rational choice and environmental deterrence in the retention of mandated drug abuse treatment clients. *Int J Offender Ther Comp Criminol* 2007;51(6):686–702.
27. Butzin CA, Saum CA, Scarpitti FR: Factors associated with completion of a drug treatment court diversion program. *Subst Use Misuse* 2002;37:1615–1633.
28. Wong EC, Longshore D: Ethnic identity, spirituality, and self-efficacy influences on treatment outcomes among Hispanic American methadone maintenance clients. *J Ethn Subst Abuse* 2008;7:328–340.
29. Avants SK, Margolin A, Mckee S: A path analysis of cognitive, affective, and behavioral predictors of treatment response in a methadone maintenance program. *Subst Abuse* 2000;11:215–230.
30. Simpson DD, Joe GW, Broome KM, Hiller ML, Knight K, Rowan-Szal GA: Program diversity and treatment retention rates in the Drug Abuse Treatment Outcome Study (DATOS). *Psychol Addict Behav* 1997;11:279–293.

31. Hiller ML, Knight K, Leukefeld C, Simpson DD: Motivation as a predictor of therapeutic engagement in mandated residential substance abuse treatment. *Crim Justice Behav* 2002;29:56–75.
32. Kokkevi A: The Treatment Unit Form. Lisbon, EMCDDA, 1997.
33. Oeberg D, Sallmen B, Kaplan C, McMurphy S, Ackerson T, Krantz L, Martens P, Schlyter F, Turner T: The Addiction Severity Index – Crime Module. Hoeoer, Karlsvik Rehabilitation Center, 1998.
34. Kokkevi A, Hartgers C: Europe ASI: European adaptation of a multidimensional assesment instrument for drug and alcohol dependence. *Eur Addict Res* 1995;1:208–210.
35. Blanken P, Hendriks V, Pozzi G, Tempesta E, Hartgers C, Koeter M, Fahrner A, Gsellhofer B, Kufner H, Kokkevi A, Uchtenhagen A: European Addiction Severity Index: A Guide to Training and Administering EuropASI Interviews. Lisbon, EMCDDA, 1994.
36. Kelly JF, Finney JW, Moos R: Substance use disorder patients who are mandated to treatment: characteristics, treatment process, and 1- and 5-year outcomes. *J Subst Abuse Treat* 2005;28:213–223.
37. Rollnick S, Heather N, Gold R, Hall W: Development of a short 'readiness to change' questionnaire for use in brief, opportunistic interventions among excessive drinkers. *Br J Addict* 1992;87:743–754.
38. DiClemente CC, Prochaska JO: Self-change and therapy change of smoking behavior: a comparison of processes of change in cessation and maintenance. *Addict Behav* 1982;7:133–142.
39. West R: Time for a change: putting the Transtheoretical (Stages of Change) Model to rest. *Addiction* 2005;100:1036–1039.
40. Prochaska JO: Moving beyond the transtheoretical model. *Addiction* 2005;101:768–774.
41. Kraemer HC, Wilson GT, Fairburn CG, Agras WS. Mediators and moderators of treatment effects in randomized clinical trials. *Arch Gen Psychiatry* 2006; 59:877–883.

Table 1: Participant intake characteristics of quasi-compulsory and voluntary groups.

	Quasi-compulsory group	Voluntary group	<i>p</i>	Effect size
N	430	415		
Age (M; SD)	31.6; 7.5	31.0; 7.6	.43	
Male (%)	86.1	77.4	.01	<i>w</i> =0.11
Married (%)	11.2	11.8	.85	
School education in years (M; SD)	9.6; 2.1	10.1; 2.2	.01	<i>d</i> =0.21
Substance use				
Heroin use (% last month)	54.8	50.4	.52	
Heroin use lifetime in years (M; SD)	6.9; 5.8	6.2; 5.5	.13	
Cocaine use (% last month)	40.8	39.9	.88	
Cocaine use lifetime in years (M; SD)	5.1; 5.1	4.7; 5.0	.45	
Crack use (% last month)	28.3	11.4	.00	<i>w</i> =0.21
Multiple drug use (% last month)	60.9	55.3	.44	
Ever injected (%)	70.2	71.3	.77	
Problematic alcohol use (% last month)	19.9	24.2	.30	
Years of excessive alcohol use (M; SD)	3.1; 5.7	4.5; 8.0	.04	<i>d</i> =0.20
Committed high-severity crimes (% ever)	90.0	70.2	.00	<i>w</i> =0.25
Perceived pressure				
Medical pressure (M; SD)	1.5; 1.0	1.4; 0.9	.54	
Families and/or friends (M; SD)	2.1; 1.4	2.3; 1.4	.01	<i>d</i> =0.17
Employer (M; SD)	1.1; 0.5	1.1; 0.6	.43	
Legal authorities (M; SD)	2.9; 1.6	1.4; 0.9	.00	<i>d</i> =1.19
Yourself (M; SD)	3.5; 1.5	3.8; 1.4	.00	<i>d</i> =0.19
Others (M; SD)	1.3; 0.9	1.3; 0.9	.86	
Self-efficacy (M; SD)	3.4; 0.5	3.3; 0.5	.04	<i>d</i> =0.17
Action Stage of change (%)	46.0	43.2	.49	
Employment and health				
Number of working days last month (M; SD)	5.7; 10.6	3.3; 8.0	.11	
Longest period of unemployment in years (M; SD)	4.7; 4.9	3.2; 4.2	.00	<i>d</i> =0.32
Number of days listed as sick last month (M; SD)	2.9; 8.6	5.5; 10.9	.01	<i>d</i> =0.27
Medical care last six months (%)	46.7	54.0	.08	
Homeless last month (%)	20.5	14.3	.07	
Serious psychiatric problems last month (%)	57.0	58.8	.71	
Serious depression (% lifetime)	56.9	64.0	.10	
Serious anxiety or tension (% lifetime)	59.0	64.0	.18	
Serious suicidal thoughts (% lifetime)	42.0	48.7	.14	
Serious hallucinations (% lifetime)	20.8	18.4	.48	

Table 2: Intake predictors of treatment retention

<i>Variable</i>	OR	OR 95% CI
Age	1.03*	1.00-1.05
Male	1.04	0.68-1.58
Married	0.98	0.59-1.61
School education in years	0.94	0.86-1.04
Substance use		
Heroin use last month	0.60*	0.37-0.97
Heroin use lifetime in years	1.02	0.99-1.06
Cocaine use last month	0.65	0.41-1.02
Cocaine use lifetime in years	0.98	0.95-1.02
Crack use last month	0.48*	0.26-0.87
Multiple drug use last month	0.41**	0.24-0.68
Ever injected	0.81	0.52-1.27
Problematic alcohol use last month	0.85	0.50-1.45
Years of excessive alcohol use	1.02	0.99-1.05
Committed high-severity crimes	0.84	0.55-1.29
Perceived pressure		
Medical pressure	1.23	0.97-1.57
Families and/or friends	0.95	0.84-1.07
Employer	1.38	0.94-2.03
Legal authorities	1.13	0.99-1.29
Yourself	0.98	0.88-1.09
Others	1.16	0.93-1.45
Self-efficacy	1.41	0.97-2.07
Action stage of change	1.13	0.80-1.58
Employment and health		
Number of working days last month	1.03*	1.01-1.06
Longest period of unemployment in years	0.98	0.93-1.02
Number of days listed as sick last month	0.99	0.97-1.01
Medical care last 6 months	0.85	0.59-1.24
Homeless last month	0.73	0.48-1.10
Serious psychiatric problems last month	0.65*	0.47-0.92
Serious depression lifetime	0.71*	0.52-0.96
Serious anxiety or tension lifetime	0.97	0.69-1.35
Serious suicidal thoughts lifetime	0.90	0.63-1.27
Serious hallucinations lifetime	0.84	0.53-1.33

Note. Separate binary logistic regression model for each intake variable. * $p < .05$; ** $p < .01$.

Figure captions

Figure 1

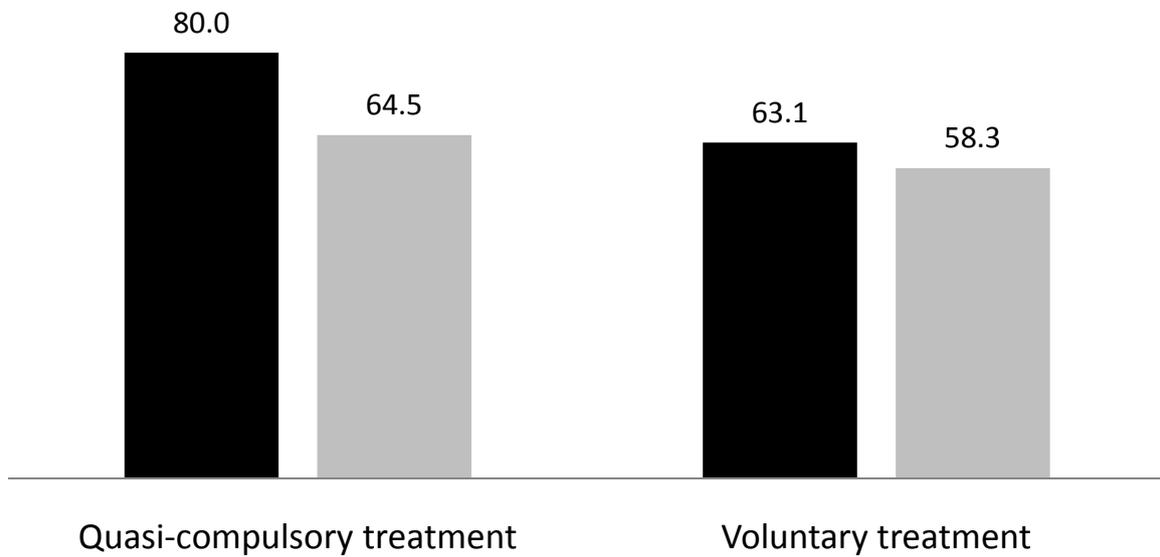
Perceived medical pressure moderating the effect of quasi-compulsory versus voluntary treatment on treatment retention.

Figure 2

Multiple drug use in the previous month moderating the effect of quasi-compulsory versus voluntary treatment on treatment retention.

Percentage of treatment retention

■ Perceived medical pressure high ■ Perceived medical pressure low



Percentage of treatment retention

■ Poly drug use in previous month ■ No poly drug use in previous month

