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Effects of Personalized Feedback Interventions on Drug-Related Reoffending: a Pilot Study

Kenji Yokotani[1,2] · **Katsuhiro Tamura**[1]

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Abstract Addiction is serious problem that requires effective treatment. Previous studies support personalized feedback interventions (PFIs) as an effective treatment for drinking; however, the potential beneficial effects of this treatment on illegal drug use have not been explored. The present study examined the effects of PFIs in a sample of repetitive drug-related offenders. Participants were 50 repetitive drug-related offenders incarcerated in a Japanese prison. They were randomly assigned to the PFIs (n=20) or control (n=30) group. The PFIs group received six letters for 3 months, whereas the control group did not undergo any interventions. We defined relapse and recidivism as drug-related reoffending and reentering prison after release, respectively. In the 3.6-year follow-up analysis (range, 0.1–5.8 years), participants' criminal records were examined, and results indicated a decreased risk of relapse and recidivism for the PFIs group relative to the control group, even when controlling for age, educational level, number of prison terms, and sentence length. Thus, our findings suggest that PFIs reduce the likelihood of relapse and recidivism in drug-related offenders.

Keywords Methamphetamine · Amphetamine · Personalized feedback intervention · Drug-related reoffending · Recidivism

Addictive behavior is a serious concern worldwide. In 2010, the prevalence of alcohol use disorders was reported to be around 6.4 % in most countries (World Health Organization [WHO] 2010), and the prevalence of illicit drug-related disorders was estimated at 1.6 % in the USA (WHO 2010). Moreover, illicit drug use is associated with criminal behavior (Nurco et al. 1991). Thus, effective treatments for addiction are necessary (WHO 2010). Recent studies have indicated that personalized feedback intervention (PFI) is an effective strategy for the treatment of addictive disorders (Walters and Woodall 2003). PFIs are an indirect (not face-to-face) treatment method (Dimeff et al. 1999) that combines motivational interviewing methods (Miller and Rollnick 2013) with the provision of accurate information, feedback based on personalized risk factors, and skill-building to decrease relapse risk. The present study examined the efficacy of PFIs for treating illegal drug abuse.

Previous studies have confirmed the efficacy of PFIs for reducing drinking behavior (Walters and Neighbors 2005). The results of numerous randomized control trials suggest that even Internet-based PFIs can prevent event-specific heavy drinking (Neighbors et al. 2009), decrease alcohol consumption in employees (Walters and Woodall 2003), and decrease the alcohol use of patients with alcohol abuse problems (McKay et al. 2010). However, few studies have examined the effects of PFIs on illegal drug use and have yielded inconsistent results. For example, one particular Internet-based PFI might be effective for college marijuana users with a family history of drug use (Lee et al. 2010), but the effect of the same PFI might be less prominent in college marijuana users who were mandated to receive the PFI (White et al. 2008). Computerized feedback was also demonstrated to reduce the frequency of marijuana use in a quasi-experimental design (Budney et al. 2011), but not in a randomized controlled design (Palfai et al. 2014; Towe 2012). One quasi-experimental study reported that computerized feedback reduced methamphetamine use (Kay-Lambkin 2008), but the effects of this method were unclear in a randomized controlled design.

✉ Kenji Yokotani
yokotani@n-seiryo.ac.jp

[1] Niigata Prison, Niigata-shi, Niigata 951-8121, Japan

[2] Graduate School of Clinical Psychology, Niigata Seiryo University, 1-5939, Suidocho, Chuo-ku, Niigata-shi, Niigata 951-8121, Japan

As PFIs could theoretically serve to reduce any type of addictive behavior, including illegal drug use (Dimeff et al. 1999; Miller and Rollnick 2013), the aim of the present study was to clarify the treatment effects of PFIs for illegal drug users. We sampled inmates of Japanese prisons that were incarcerated for drug-related crimes, as these individuals were likely to have severe drug abuse tendencies. Those imprisoned for drug-related offenses in Japan are (1) mostly individual users [97 % from 2001 to 2005; Research and Training Institute of the Ministry of Justice (RTIMJ) 2006] and (2) repetitive drug use-related offenders. This is because first-time drug use-related offenders usually receive only suspended prison sentences (95 % from 1948 to 2006), whereas repetitive drug-related offenders tend to receive sentences without parole (79 % of second-time reoffenders and 93 % of third-time reoffenders; RTIMJ 2009). As a result, the majority of people in Japanese prisons for drug-related offenses are likely to be repetitive illegal drug users with severe drug-related problems.

This study was designed to test two hypotheses. First, drug-related offenders who received PFIs will be at lower risk for drug-related reoffending after their release compared to those who did not. Furthermore, illicit drug use is associated with criminal behavior (Nurco et al. 1991), so drug-related offenders who are at lower risk for drug-related reoffending might also be at lower risk for recidivism (Messina et al. 1999). The second hypothesis is that drug-related offenders who received PFIs will be at lower risk for recidivism after their release compared to those who did not.

Method

Design and Participants

Potential participants were 243 male drug-related offenders who were incarcerated in a Japanese prison during February of 2008. The prison studied here has provided mandatory PFIs for all drug-related offenders since April 2010. The mandatory PFIs consist of six letters and require three months to complete (June 2010). Hence, those who were released before June 2010 were excluded (n=183). Furthermore, we terminated follow-up in January 2015. Hence, those who were still imprisoned in January 2015 (n=2) were excluded. Because our follow-up was based on the Japanese criminal record system, foreign criminals who were subsequently deported were excluded (n=5). Finally, there were 50 eligible participants. All were male drug-related offenders (see Fig. 1). The most common crimes among 38 participants were drug-related. Thirty-four had mainly used stimulants (methamphetamine and/or amphetamine); and three and one had mainly used cannabis and opium, respectively. The other 12 had committed drug-unrelated offenses, but were under the influence of an illegal drug at the time of arrest (n=5 robbery, n=4 theft, n=1 rape, n=1 extortion, n=1 violation of gun control act). As 83.5 % of illegal drug offenses in Japan involve stimulants (National Police Agency 2015), these 12 participants were likely under the influence of a stimulant. A previous study in the same prison reported that inmates' starting age of paint thinner, stimulant, and cannabis use were 15, 20, and 23 years old, respectively (Yokotani 2014). They also used these drugs 22, 39, and 10 times per month, respectively (Yokotani 2014). These data suggest that they were multiple drug users with long history of drug use.

Forty-four of the participants were originally from Japan, while the others were from Iran (2), China (1), Korea (1), Ghana (1), and Nepal (1). The 50 participants were not significantly different from the excluded inmates (n=193) in terms of age, education level, and number of prison terms. However, the participants did have a significantly longer mean sentence than the excluded inmates (t=7.78, p<0.001, df=241). Hence, the participants mainly reflect the prison population, except for sentence length.

During the initial stage of the project, limited human resources at the prison prevented the provision of PFIs to all offenders and allowed only 20 participants to receive PFIs. Hence, the participants were assigned to either the PFIs group (n=20) or the non-PFIs group (n=30) in a randomized fashion. Participants were randomly selected according to their identified numbers in prison. They read and wrote the letters associated with the PFIs in their community cells in the prison. The community cells contained 8 to 12 inmates. These cellmates worked together during the day. Some cells included multiple members of the PFIs group, while other cells included only a single member.

Table 1 shows the demographic characteristics of the PFIs and non-PFIs groups. The two groups were not significantly different in terms of age, education, number of prison terms, years of present sentence, and follow-up duration.

The present study was approved by an institutional board at the prison and an ethics committee of a local university in Japan. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Interventions

Structure of Interventions The PFIs group received a mandatory PFI, which included six personalized feedback letters sent over the course of three months (two times per month), but did not include an initial assessment interview because participants had already been rigorously assessed by narcotic agents and prosecutors. Participants received and replied to all six letters while in prison. None of the participants was released before they completed six letters and did not receive any letters from the prison after their release.

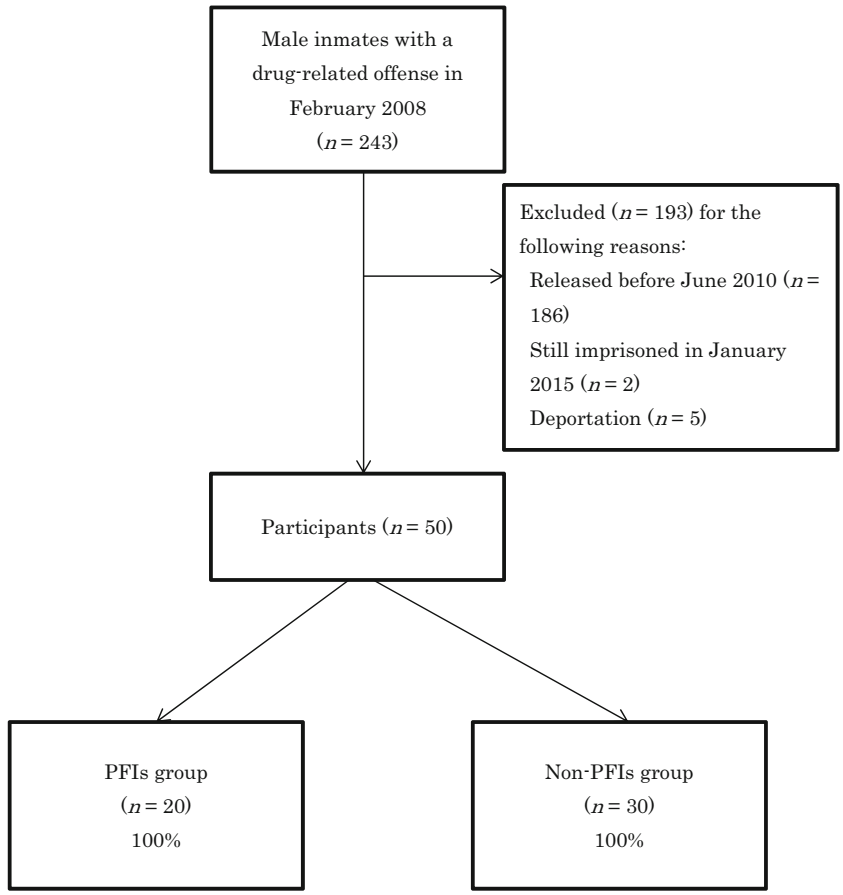

Fig. 1 Allocation of participants and follow-up rates. *PFIs*: personalized feedback interventions

Content of the Interventions The first letter (no. 1) asked participants how much they paid for the drug. For example, they indicated the duration of drug use (month), frequency of drug use per month, and cost per use. They also indicated opportunistic costs. For example, they indicated the number of days they missed work because of drug use, how many

Table 1 Participants' age, educational levels, and criminal histories

	Total N=50		PFIs group n=20		Non-PFIs group n=30		df= 48	
	M	S.D.	M	S.D.	M	S.D.	t	d
Age (years)	41.5	10.5	43.3	9.3	40.3	11.1	0.9	0.2
Education (years)	10.1[a]	1.6	10.5	1.9	9.9[b]	1.4	0.4[c]	0.3
Number of prison terms[d]	3.1	2.2	3.7	2.2	2.7	2.2	1.5	0.4
Present sentence (years)	5.7	2.0	5.8	1.9	5.5	2.1	0.5	0.1
Post-treatment measures	M	S.D.	M	S.D.	M	S.D.	t	d
Follow-up duration after their release (years)	3.6	1.1	3.4	1.1	3.7	1.0	1.1	−0.3
	%	*n*	%	*n*	%	*n*		
Drug-related reoffending (%)	24	12	15	3	30	9		
Recidivism (%)	34	17	25	5	40	12		

One participant's educational level was unknown

Note. *PFIs*: personalized feedback interventions

[a] n=49

[b] n=29

[c] df=47

[d] The number of prison terms only includes terms served as an adult

days they could not work because of their imprisonment, and how much they were paid per day. The second letter (no. 2) explained the definition of drug abuse and drug-induced suffering. For example, the letter explained tolerance, withdrawal symptoms, secondary mental illness, and secondary physical illness regarding drug use. The third letter (no. 3) asked participants to indicate the negative social and economic effects of drug use. They also indicated why they would like to stop using drugs and described their anticipated daily life after drug-use cessation. The fourth letter (no. 4) asked them to write a letter to their significant other and an imaginary reply from their significant other. The fifth (no. 5) letter asked them to indicate ways in which to avoid drug use when confronted with a risky situation. The sixth (no. 6) letter asked them to indicate daily activities in which they could engage to prevent relapse after their release. The second, third, and fifth letters corresponded to items used in the Brief Alcohol Screening and Intervention for College Students (Dimeff et al. 1999). Letter no. 1 corresponded to that used in Lee et al. (2010).

Feedback Approach A prison director for treatment provided personalized feedback through mail. The director directly handed the mail to participants and obtained their replies from chief prison guards. When the director handed the mail to the participants, they could see him but were not permitted to talk because they were working. Hence, the participants mainly received feedback via mail; provision of in-person feedback was limited.

The feedback included positive evaluation. For example, many participants initially reported their level of understanding as D ("do not understand very well") or E ("do not understand at all") in the second letter because of unclear medical terms. The director upgraded their level to A ("understand very well") or B ("understand") with clear evidence that their reports exactly reflected their depth of understanding ("You exactly explained withdrawal symptoms. 'A' is appropriate for you than 'D'."). Some participants also indicated that they could not stop using drugs because of weak will (no. 5). Thus, we informed them that they have many strategies that they could employ to stop using drugs ("You have many reasons to stop using drugs. Tell me your concrete ways in which to prevent drug use").

The feedback also included concrete questions. Many participants were unable to write an imaginary reply from their significant other (no. 4). In these cases, we replied "When you go back home, how will you talk to her and how will she respond to you? Please write her response in this letter." Most participants also indicated that a regular job and good friendships are important for their abstinence (no. 6). We replied, "What is your regular job? Please indicate your ideal job. Who are your good and bad friends? Please indicate you friends' names."

Measures and Analysis

We defined relapse as drug-related reoffending and reviewed participants' criminal records in January 2015 to determine whether any incidences of relapse had occurred. The Kaplan–Meyer survival method was used to estimate the relapse-free survival duration (i.e., period of time in which participants did not commit any drug-related offenses). If they committed a drug-related offense, their survival duration was calculated based on the dates of their release and imprisonment. If they committed a drug-unrelated offense (e.g., theft), the day of their imprisonment demarcated the end of their survival duration. If they did not reoffend, the end of their survival duration was January 2015. In the same way, we defined recidivism as reentering prison and calculated a recidivism-free survival curve.

Cox's proportional-hazard regression models were used to account for length of time and to obtain crude and adjusted hazard ratios. Young age (Langan and Levin 2002), a lengthy imprisonment (Gendreau et al. 1999), number of prison terms (Langan and Levin 2002), and limited years of education (Stevens and Ward 1997) increase general re-offense risk. Thus, these variables were used as adjustment variables.

According to previous studies (Dupont and Plummer 1990; Schoenfeld and Richter 1982), we analyzed the power of our hypothesis testing. The 50 participants had entered the prison between March 8, 2002, and May 3, 2008. Hence, the accrual interval was 6.2 years. Our follow-up duration was 69.5 months, so the additional follow-up was 5.8 years. The ratio of control to experimental patients was 1.5. The type I error probability associated with this test of null hypothesis was set as 0.05.

Results

Descriptive Results

After they were released, 17 (34 %) of the participants returned to prison. Five had committed a drug-unrelated offense (theft, property destruction, injury, unlawful entry, and violation of road traffic acts). The other 12 had committed a drug-related offense (all had violated stimulant control acts). Among these 17 reoffenders, 9 were still imprisoned on January 2015, but the other 8 had been released. They were released between August 2012 and October 2014 (mean: August 2013). One participant reentered a prison multiple times during the follow-up duration (one participant with a drug-related sentence was released in April 2011 and reentered the prison in October 2011 because of stimulant use. He was released again on April 2013 and reentered the prison on July 2013 because of theft), but the others did not.

These 17 reoffenders survived for an average of 1.1 years (*S.D.*=0.8) in free society and received an average prison term of 2.4 (1.3) years (n=15; the sentence lengths of two participants had not been decided). Similarly, the 12 drug-related reoffenders survived for an average of 1.2 years (0.9) in free society and received an average prison term of 2.6 (1.2) years (n=11; one participant's sentence length had not yet been decided).

Furthermore, age was positively correlated with number of prison terms (r=.51, df=48), whereas present sentence length was negatively correlated with follow-up duration (r=−.55, df=48).

Treatment Effects of Personalized Feedback Interventions on Drug-Related Reoffending

The treatment effects of the PFIs were analyzed via a comparison between the PFIs and non-PFIs groups. Figure 2 shows the differences in the relapse-free survival curves between the PFIs and non-PFIs groups. PFIs were significantly associated with decreased risk of drug-related reoffending both on crude and adjusted hazard levels (Table 2).

Table 2 also shows two inconsistent effects on drug-related reoffending. First, the number of prison terms was associated with increased risk of drug-related reoffending on the adjusted hazard level, although the crude hazard ratio was not significant. Second, length of the present sentence might have been associated with decreased risk of drug-related reoffending on the crude hazard level, while the adjusted hazard ratio for sentence length was not significant.

Treatment Effects of Personalized Feedback Interventions on Recidivism

Figure 3 shows the differences in the recidivism-free survival curves between the PFIs and non-PFIs groups. PFIs were significantly associated with decreased risk of recidivism both on crude and adjusted hazard levels (Table 2).

Table 2 also shows two consistent findings. First, length of the present sentence was significantly associated with decreased risk of recidivism both on crude and adjusted hazard levels. Furthermore, number of prison terms was significantly associated with increased risk of recidivism both on crude and adjusted hazard levels.

Table 2 also shows one inconsistent finding. Participants' age might have been associated with decreased risk of recidivism on the adjusted hazard level, while the crude hazard ratio for age was not significant.

Power Analysis

Although the PFIs were significantly associated with decreased risk of drug-related reoffending and recidivism, the power analysis did not indicate satisfactory power (above 0.80) for our hypothesis testing. Log-rank tests did not support these findings (drug-related reoffending χ^2=1.71, p=0.19, recidivism χ^2=1.45, p=0.22).

The fifth (median) drug-related reoffender in the non-PFI group survived 0.79 years in free society. If the true hazard ratio of non-PFI subjects relative to PFI subjects is 1.73 (converted adjusted hazard ratio), we will be able to reject the null hypothesis that the PFI and the non-PFI survival curves are equal with a probability (power) 0.473. To reach a power of 0.80, we need 44 PFIs and 66 non-PFIs participants. Similarly, the sixth (former median) and seventh (later median) reoffenders in the non-PFI group survived 0.67 and 0.79 years in free society, respectively. If the true hazard ratio of non-PFIs subjects relative to PFIs subjects is 1.67 (converted adjusted hazard ratio), we will be able to reject the null hypothesis that the PFIs and the non-PFIs survival curves are equal with a probability (power) of 0.426. To reach a power of 0.80, we will need to examine 50 PFIs and 75 non-PFIs participants.

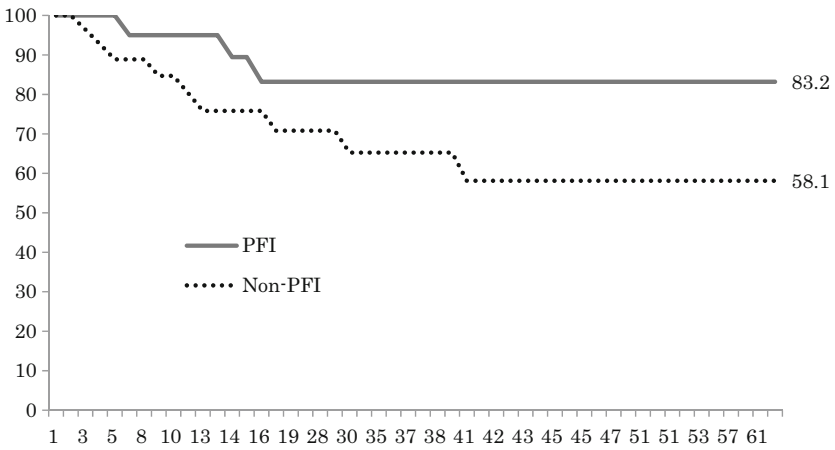

Fig. 2 Relapse-free survival curves of the PFIs and Non-PFIs groups. *PFIs*: personalized feedback interventions; *vertical axis* reflects the survival percentages of the two groups; *horizontal axis* reflects their relapse-free survival months in free society

Table 2 Cox's proportional-hazard regression analysis for personalized feedback interventions and drug-related reoffending/recidivism at 3.6 years

	Drug-related reoffending at 3.6 years								Recidivism at 3.6 years							
	Crude hazard ratio				Adjusted hazard ratio				Crude hazard ratio				Adjusted hazard ratio			
	Exp.β	[95 % CI]		p	Exp.β	[95 % CI]		p	Exp.β	[95 % CI]		p	Exp.β	[95 % CI]		p
PFIs (Yes: 1, No: 0)	0.44	[0.32	0.60]	***	0.27[a]	[0.13	0.59]	***	0.44	[0.31	0.61]	***	0.33[a]	[0.17	0.65]	***
Age (years)	0.96	[0.91	1.02]		0.92[a]	[0.85	1.00]		0.96	[0.91	1.01]		0.91[a]	[0.84	0.98]	**
Present sentence (years)	0.74	[0.59.	0.94]	*	0.79[a]	[0.56	1.11]		0.67	[0.53.	0.84]	***	0.74[a]	[0.55	0.98]	*
Number of prison terms	1.11	[0.91	1.35]		1.44[a]	[1.05	1.97]	*	1.20	[1.01	1.43]	*	1.56[a]	[1.20	2.02]	***
Education (years)	0.96[a]	[0.76	1.21]		1.32[a]	[0.83	2.09]		0.90[a]	[0.72	1.13]		1.30[a]	[0.85	1.97]	

Note. To obtain crude hazard ratios for variables, they were entered separately into Cox's proportional-hazard regression analysis

Exp. exponential, *CI* confidence Interval, *PFIs* personalized feedback interventions

[a] n=49, N=50

***p<0.001, **p<0.01,*p<0.05

Discussion

The present findings support our hypothesis that PFIs decrease repetitive illegal drug users' risk of drug-related reoffending. Thus, our results add theoretically-consistent (Dimeff et al. 1999; Miller and Rollnick 2013; Walters and Woodall 2003) pilot data to the accumulated previous findings (Budney et al. 2011; Kay-Lambkin 2008; Lee et al. 2010; Palfai et al. 2014; Towe 2012; White et al. 2008). Furthermore, our findings also support our hypothesis that PFIs decrease recidivism risk among drug-related reoffenders. Surely, our limited sample was subject to statistical errors. However, the relatively long follow-up duration (~5.8 years) and nearly perfect follow-up rates also serve to corroborate our findings. Moreover, the inclusion of Japanese samples and antisocial groups also broadens the applicability of PFIs.

The relapse-free survival curves also suggested that the PFIs and non-PFIs groups had not relapsed after being released for 1.3 and 3.4 years, respectively. The recidivism-free survival curves also suggested that the PFIs and non-PFIs groups had not reentered prison after being released for 1.9 and 3.4 years. These data suggest that drug-related offenders are at risk for relapse during the first 3.4 years after their release (e.g., Research and Training Institute of the Ministry of Justice 2012), but that their risk levels might decrease after 3.4 years. Thus, intensive support during the first several years might be beneficial for them (e.g., Messina et al. 1999). Furthermore, the PFIs group was considered to be recovering for 1.3 years after release, whereas the non-PFI group was considered to be recovering for 3.4 years after release. These data may suggest that the recovery period decreased by half in the PFIs group. The repetitive and personal feedback might have helped the PFIs group to construct drug-free survival strategies to employ in free society. Thus, members of the PFIs group might have had several drug-free strategies in mind upon release, and consequently were able to better cope with the recovery period.

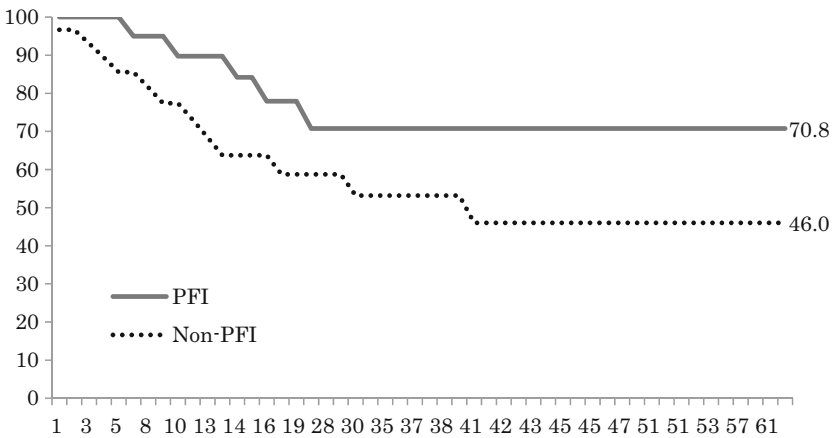

Fig. 3 Recidivism-free survival curves of the PFIs and Non-PFIs groups. PFIs: Personalized Feedback Interventions; Vertical axis reflects the survival percentages of the two groups. Horizontal axis reflects their recidivism-free survival months in free society

The number of prison terms increased both crude and adjusted recidivism risk. These findings are consistent with those of previous studies (Langan and Levin 2002). On the other hand, older age decreased adjusted, but not crude, recidivism risk, which is similar to the findings of one previous study (Langan and Levin 2002; Research and Training Institute of the Ministry of Justice 2012). In the present study, older age was positively correlated with number of prison terms, so the simple effects of age might have been offset by number of prison terms.

In contrast to previous studies (Gendreau et al. 1999), lengthy imprisonment decreased the risk of recidivism in our study. However the length of imprisonment in our study was negatively correlated with follow-up duration. The limited follow-up duration needs to be taken into account when interpreting our findings, and future studies should employ longer follow-up durations. Furthermore, education level did not predict recidivism risk. While the participants of one relevant previous study had attained a college-level education (Stevens and Ward 1997), most of our participants had less than a junior high school-level education. Thus, the differences in education level might have contributed to the different outcomes.

Environmental differences between the present study and previous studies should be noted. In previous studies, participants (college students, employees) received PFIs in free society, so they might have had access to illegal drugs during an intervention period via friends and drug dealers (e.g., Budney et al. 2011; Kay-Lambkin 2008; Lee et al. 2010; Palfai et al. 2014; Towe 2012; White et al. 2008). However, the current incarcerated participants were not able to access any drug until they had completed the intervention and were released from the prison. They were not able to contact any friends freely during imprisonment. Thus, the current participants may have regarded any written materials, including those pertaining to the intervention, as particularly valuable, which may have enhanced its effects. Furthermore, the limited sample size during the initial stage of the intervention might have led the PFIs group to believe that they were elite in the prison, even though they were selected at random. These uncontrolled variables might have affected our findings.

The present study had four limitations. First, our pilot study should be cautiously interpreted, as the number of participants was small (N=50), and the groups were not equally divided. Indeed, our power analysis required around twice the number of participants to sufficiently reject the null hypotheses. Second, our study did not control participants' previous drug use history, drug use disorders, and psychiatric symptoms. These variables affect drug-related reoffending, so future study should control these variables. Third, the incidence of drug-related reoffending does not necessarily reflect relapse rate. It is possible that some participants had used illegal drugs after their release, but their use had remained undetected and consequently undocumented. Fourth, the within-group treatment effects might be different because we did not adjust for cellmates and release date. Some participants might have been bothered by their cellmates, while others may not have. Similarly, some participants were released shortly after the PFIs, while others were not. Thus, these heterogeneities should be controlled for in future studies.

Despite these limitations, the present study is the first to validate theorized treatment effects of PFIs on drug-related reoffending using a randomized controlled design, at least to our knowledge. Addiction causes health problems (WHO 2010) and criminal behaviors (Nurco et al. 1991; RTIMJ 2006, 2009) across the world. Cost-effective treatment for addiction remains a paramount concern (WHO 2010). PFIs use a relatively simple format at limited cost to effectively treat people who suffer from addictive disorders (McKay et al. 2010; Neighbors et al. 2009; Walters and Neighbors 2005; Walters and Woodall 2003). These findings suggest that implementation of PFIs with imprisoned repetitive illegal-drug users could be fruitful with respect to increasing quality of life and reducing the burden of repeated offenses on society.

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Conflict of Interest The authors declare that they have no conflict of interest.

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