Psychiatry and Clinical Neurosciences (2005), **59**, 311–318

Regular Article

Drug preferences in illicit drug abusers with a childhood tendency of attention deficit/hyperactivity disorder: A study using the Wender Utah Rating Scale in a Japanese prison

TOSHIHIKO MATSUMOTO, MD, PhD,[1,3] AKIKO YAMAGUCHI, MA,[4] TAKESHI ASAMI, MD,[3] ATSUSHI KAMIJO, MD,[3] EIZO ISEKI, MD, PhD,[3,5] YOSHIO HIRAYASU, MD, PhD[3] AND KIYOSHI WADA, MD, PhD[2]

[1]*Division of Forensic Psychiatry,* [2]*Division of Drug Dependence Research, National Institute of Mental Health, National Center of Neurology and Psychiatry, Chiba,* [3]*Department of Psychiatry, Yokohama City University School of Medicine,* [4]*Counseling Center, Kanto-gakuin University, Kanagawa, and* [5]*Department of Psychiatry, Juntendo University School of Medicine, Tokyo, Japan*

Abstract The purpose of this study is to clarify the relationship between childhood tendencies of attention deficit/hyperactivity disorder (AD/HD) and illicit drug abuse in Japanese prisoners, and to clarify whether drug abusers with AD/HD prefer methamphetamine (MAP) more than other illicit drugs. The Japanese version of the Wender Utah Rating Scale (WURS), which is a self-reporting instrument to retrospectively identify childhood tendencies of AD/HD tendencies, was carried given to 413 prisoners without a drug addiction and 282 prisoners with a drug addiction (192, MAP; 53, toluene; and 37, cannabis). WURS scores were compared between prisoners with and without a drug addiction, and between MAP, toluene, and cannabis abusers. Consequently, prisoners with a drug addiction showed significantly higher WURS scores than those without the addiction ($P < 0.001$). Toluene abusers showed significantly higher WURS scores than cannabis abusers ($P < 0.001$), and included a higher proportion with scores over cut-off than MAP or cannabis abusers ($P = 0.005$). In conclusion, a close relationship existed between illicit drug abuse and childhood AD/HD tendencies. Drug-abusing prisoners with AD/HD tendencies were not prone to choose MAP over other illicit drugs.

Key words attention deficit/ hyperactivity disorder, methamphetamine, prisoners, Wender Utah Rating Scale.

INTRODUCTION

Many recent studies have reported that the existence of attention deficit/hyperactivity disorder (AD/HD) promotes early onset of substance use disorder.[1–4] Other studies further suggest that persistent AD/HD symptoms may predispose a person to the development of a conduct disorder, which in turn would increase the risk of illicit drug abuse.[5–7] Horner reported that individuals with childhood histories of AD/HD were likely to improve a negative self-image by illicit drug use, with consequent development of a drug dependence.[8] Some researchers maintained that abolishing AD/HD symptoms may be a critical early intervention in this context; methylphenidate therapy for a child with AD/HD, therefore, could reduce the risk of subsequent illicit drug abuse.[9,10]

Many studies have reported that cocaine abusers were likely to have childhood histories of AD/HD among those using various types of iliicit drugs.[11–14] Cocaine has been reported to act as a dopaminergic agent that is popular as a stimulant in western countries.[15] These findings suggested that cocaine abusers

Correspondence address: Toshihiko Matsumoto, Department of Forensic Psychiatry, National Institute of Mental Health, National Center of Neurology and Psychiatry, 4-1-1 Ogawa-Higashi, Kodaira, Tokyo 187, Japan. Email: tmatsu@ncnp-k.go.jp

Received 10 September 2004; revised 27 October 2004; accepted 15 November 2004.

with childhood AD/HD histories may be medicating a dopamine-deficient state with cocaine, similarly to AD/HD children medicated with methylphenidate, which is also a stimulant.[11,12] Some studies have reported that pharmacotherapy with methylphenidate or other dopamine agonists may be conducive to cocaine dependence.[6,16]

However, it remained unclear whether drug abusers with childhood AD/HD histories actually choose a stimulant as a form of self-medication. If this hypothesis is true, drug abusers in Japan with childhood AD/HD might be expected to favor methamphetamine (MAP) rather than other drugs, since MAP is the most popular stimulant in Japan.[15]

As a stimulant, MAP has been clinically speculated to have a potency several times stronger than amphetamine,[17] and continues to be the most popular drug among drug abusers institutionalized in Japanese psychiatric hospitals.[18] The first epidemic of MAP abuse occurred in Japan shortly after the 'dumping' of large military stocks of MAP into the open market following the end of World War II. The second epidemic and even more widespread MAP abuse developed in the 1970s as the result of increased drug trade by criminal gangs despite legislation criminalizing MAP (The Stimulants Control Law, 1954). Recently, MAP abuse has risen again in Japan, with a third epidemic occurring in the mid-1990s.[19]

Studies have not been conducted in Japan to examine whether these drug abusers with childhood histories of AD/HD disorders actually chose MAP because of the self-medicating effects. There have been no epidemiologic studies conducted to show a relationship between childhood AD/HD and drug abuse in Japan. One important obstacle is that childhood information cannot be obtained accurately from their parents for retrospective evaluation of childhood AD/HD in drug-abusing adults. In the present study, we examined childhood tendencies of AD/HD using a self-reporting instrument to clarify the association between illicit drug abuse and childhood AD/HD tendencies. Additionally, to clarify any associations between childhood AD/HD tendencies and illicit drug choice, we compared the prevalence of childhood AD/HD tendencies between abusers of MAP, toluene (a volatile solvent), and cannabis, all of which have been illicit drugs popularly abused in Japan.[18]

MATERIALS AND METHODS

Subjects

The subjects were 796 consecutive male prisoners (age range, 17–36 years; mean ± standard deviation, 23.7 ± 2.4) entering a Saitama-area prison from May 2002 to October 2003. A correctional institution population was studied because of the high prevalence of drug-abusing histories in inmates. Written informed consent was obtained from all participants, and the Ethics Committee in Yokohama City University School of Medicine Center approved the present study.

Measurements

To evaluate childhood AD/HD traits, we administered the Wender Utah Rating Scale (WURS)[20] to all participating inmates within 1 week of intake. The WURS was developed as a self-reporting instrument for retrospective detection of childhood AD/HD cases in the absence of parental information. This instrument originally consisted of 61 items concerning various behavior problems in childhood prior to graduation from elementary school; generally, the 25 items showing the greatest differences between patients with childhood AD/HD and a non-patient comparison group have been used (Table 1).[20] Each WURS question is answered by selecting from five possibilities: not at all or very slightly (score = 0), mildly (score = 1), moderately (score = 2), quite a lot (score = 3), or very much (score = 4). Ward *et al*. established the validity and availability of the WURS, and demonstrated that the total score correlated significantly with the score of the Parents' Rating Scale.[20] Furthermore, they also demonstrated that a cut-off score of 36 or higher correctly identified 96% of adults with childhood AD/HD and 96% of normal control subjects, while a cut-off score of 46 or higher correctly classified 86% of adults with childhood AD/HD, 81% of depressed patients without childhood AD/HD, and 99% of normal control subjects.

For the present study, we translated the 25 most informative WURS items into Japanese with permission by Professor Paul Wender. In all items of our Japanese version, Cronbach's α coefficient of correlation calculated for all subjects was 0.903. This establishes internal consistency and, therefore, partly establishes reliability of our Japanese version, although the validity of our version has not been examined.

Procedure

We first investigated experiences of illicit drug use in the subjects with a self-reporting questionnaire asking; 'Have you used any of the following illicit drugs more than once (MAP, toluene, cannabis, LSD, MDMA, and/or other hallucinogen)?' We then classified subjects into a group consisting of 413 without use of any illicit drugs (nonabusers), and another group of 382

prisoners with prior use of illicit drugs on more than one occasion.

Furthermore, we carried out a semistructured interview in the 382 drug-abusing prisoners to select those who met the 4th edition of the Diagnostic and Statistical Manual (DSM-IV) criteria of substance use disorder (SUD) with respect to the three most popular illicit drugs in Japan: MAP, toluene and cannabis. Excluding prisoners meeting DSM-IV criteria of SUD with respect to multiple drugs (seven cases), we selected 282 drug abusers who fell into one of the following three groups: 192 MAP abusers, 53 toluene abusers, and 37 cannabis abusers.

We compared histories concerning education and substance use obtained from an initial intake interview, and also WURS scores between nonabusers and drug abusers, as well as between MAP, toluene and cannabis abusers.

Table 1. Wender Utah Rating Scale, short version[20]

As a child I was (or had):	
1.	Concentration problems, easily distracted
2.	Anxious, worrying
3.	Nervous, fidgety
4.	Inattentive, daydreaming
5.	Hot or short temp, low boiling point
6.	Temper outbursts, tantrums
7.	Trouble with stick-to-it-tiveness, not following through, failing to finish things started
8.	Stubborn, strong-willed
9.	Sad or blue, depressed, unhappy
10.	Disobedient with parents, rebellious, sassy
11.	Low opinion of myself
12.	Irritable
13.	Moody, have ups + downs
14.	Feel angry
15.	Acting without thinking, impulsive
16.	Tend to be immature
17.	Feel guilty, regretful
18.	Lose control of myself
19.	Tend to be or act irrational
20.	Unpopular with other children, didn't keep friends for long, didn't get along with other children
21.	Trouble seeing things from someone else's point of view
22.	Trouble with authorities, trouble with school, visits to the principal's office
As a child in school	
23.	Overall a poor student, slow learner
24.	Trouble with math or numbers
25.	Did not achieve up to potential

Statistical analysis

All statistical analyses were performed using SPSS software for Windows (version 11.0, SPSS Inc., Chicago, IL, USA). Student's *t*-test was performed to compare continuous variables such as age and WURS scores between nonabusers and drug abusers. ANOVA was performed to detect the difference for continuous variables between MAP, toluene and cannabis abusers. If a significant difference was found, Bonferroni's post-hoc tests were performed to establish more precisely where differences existed. Pearson's χ^2 test was performed to compare categorical variables between two or four groups. Two-tailed *P*-values under 0.05 were accepted as indicating significance.

RESULTS

Table 2 summarized results for histories of education and substance use as well as WURS scores in nonabusers and drug abusers. The nonabusers were significantly older than the drug abusers ($P = 0.002$) at the time of the study. The nonabusers significantly showed a greater number of subjects with more than 12 years education compared to the drug abusers (42.1% vs. 17.9%, $P < 0.001$). The drug abusers began smoking

Table 2. Comparison of histories of education and substance use, and the Wender Utah Rating Scale scores between nonabusers and drug abusers

	Nonabusers $n = 413$	Drug abusers $n = 282$	t/χ^2	d.f.	*P*-value
Age (years)	23.5 ± 2.4	23.0 ± 2.3	3.18	691	0.002
More than 12 years education	174 (42.1%)	50 (17.9%)	44.95	1	<0.001
Age at initial smoking (years)	15.4 ± 2.6	13.3 ± 2.0	10.58	683	<0.001
Age at initial drinking (years)	15.7 ± 3.2	13.8 ± 2.5	8.61	684	<0.001
WURS	35.5 ± 17.6	41.4 ± 17.0	4.53	691	<0.001
WURS ≥46 (score)	110 (26.6%)	118 (40.5%)	17.881	1	<0.001

WURS, Wender Utah Rating Scale.

and drinking at a significantly younger age ($P < 0.001$). Furthermore, the drug abusers showed higher WURS scores than the nonabusers ($P < 0.001$; 41.4 ± 17.0 vs. 35.5 ± 17.6; Fig. 1). A significantly higher proportion was noted in the drug abusers than compared to the nonabusers (40.5% vs. 26.6%, $P < 0.001$) for WURS score of 46 or higher.

Table 3 showed comparisons of the information concerning histories of education and substance use, and WURS scores among abusers with MAP, toluene and cannabis. A significant difference was also noted in education for more than 12 years among the three groups ($P = 0.004$). Numbers for subjects with more than 12 years of education were found most in Cannabis abusers (29.7%) followed by MAP abusers (19.6%), and toluene abusers (3.8%). Significant differences were also found in WURS scores between the three drug-defined groups ($P = 0.013$; MAP, 41.4 ± 16.4; toluene, 45.8 ± 17.6; cannabis, 35.2 ± 17.6: Fig. 2). Bonferroni's post-hoc test demonstrated that the WURS score was significantly higher in toluene abusers than in cannabis abusers ($P = 0.010$). A significant difference was also noted in proportion of subjects with WURS scores of at least 46 between the

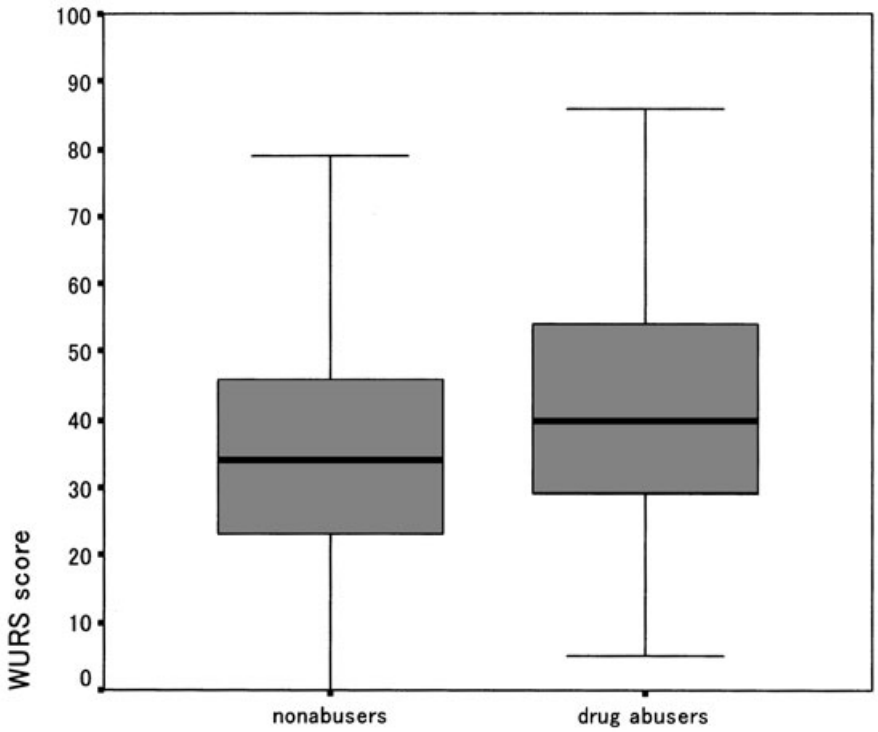

Figure 1. Comparison of Wender Utah Rating Scale scores between drug abusers and nonabusers.

Table 3. Comparison of histories of education and substance use, and the Wender Utah Rating Scale scores between the three groups

	MAP abusers $n = 192$	Toluene abusers $n = 53$	Cannabis abusers $n = 37$	F/χ^2	d.f.	*P*-value
Age (years)	24.4 ± 2.2	23.0 ± 2.2	23.4 ± 2.1	10.309	2, 279	<0.001[†]
More than 12 years education	37 (19.6%)	2 (3.8%)	11 (29.7%)	11.061	2	0.004
Age at initial smoking (years)	13.3 ± 1.9	13.2 ± 2.0	13.6 ± 2.8	0.391	2, 278	0.677
Age at initial drinking (years)	13.7 ± 2.6	13.9 ± 2.0	13.8 ± 2.9	0.107	2, 277	0.899
WURS	41.4 ± 16.4	45.8 ± 17.6	35.2 ± 17.1	4.398	2, 278	0.013[‡]
WURS ≥46 (score)	78 (40.8%)	31 (58.5%)	9 (24.3%)	10.768	2	0.005

[†]Bonferroni's post-hoc test: MAP > toluene, $P < 0.001$; MAP > cannabis, $P = 0.029$.
[‡]Bonferroni's post-hoc test: toluene > cannabis, $P = 0.010$.
MAP, methamphetamine; WURS, Wender Utah Rating Scale.

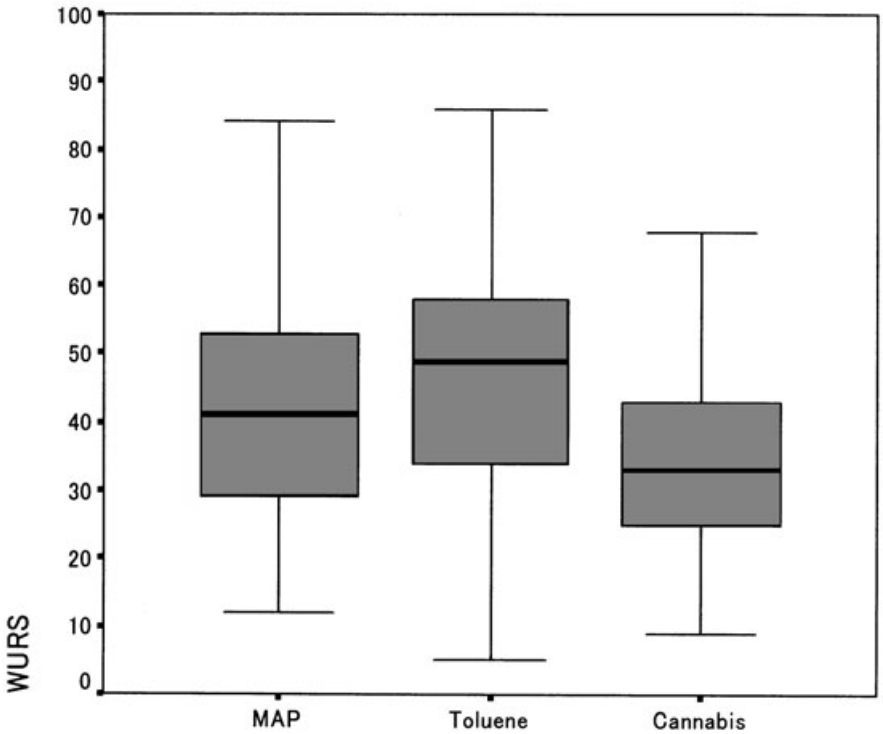

Figure 2. Comparison of Wender Utah Rating Scale scores between methamphetamine, toluene and cannabis abusers.

three groups ($P = 0.005$). Toluene abusers (58.5%) showed the highest prevalence of subjects with these high scores, followed by MAP abusers (40.8%), and finally cannabis abusers (24.3%).

DISCUSSION

To our knowledge, this is the first report to examine prevalence of childhood AD/HD tendencies in MAP and toluene abusers. Together with our previous study,[21] this also represents the first examination of the relationship between drug abuse and childhood tendencies of AD/HD, and also relationships between childhood AD/HD and drug choice, together.

Overall, prisoners with illicit drug addiction were older than those without illicit drug addiction, while mean ages differed slightly between these groups. This reflected the presence of older MAP abusers; as a group, abusers of this drug were older than toluene or cannabis abusers. In these Japanese subjects, MAP was not the first illicit drug experienced for most MAP abusers. Most of them started to use MAP by intravenous injection after a previous short period of toluene abuse.[18] A smaller numbers of abusers first started to smoke MAP after a short initial period of cannabis abuse.[19] The smaller numbers of toluene and cannabis abusers among our subjects might include prisoners at the beginning stage of drug abuse, with MAP abusers being older.

Relationships between drug abuse and childhood attention deficit/hyperactivity disorder

In the present study, prisoners with an illicit drug addiction showed higher WURS scores than those without an illicit drug addiction, while more subjects were found with a WURS score of at least 46 (the cut-off for AD/HD) among prisoners with an illicit drug addiction than those without an illicit drug addiction (40.5% vs. 26.6%). The prevalence of childhood AD/HD in both inmate groups were suspected to be considerably higher than the reported prevalence in the general population, approximately 5%,[22] although differences in evaluation methods should be considered. Childhood behavior of prisoners presumably might differ from that in the general population, accounting for some of the difference in prevalence of childhood AD/HD. Nevertheless, we found a relationship between illicit drug abuse and childhood AD/HD tendencies, as previous studies have reported.[1–4]

Many studies have noted that prevalence of childhood AD/HD was higher in the drug abusers than in the general population.[8,22–24] Studies of inpatients with drug abuse reported that 28%[23] of male drug abusers and 35%[24] of drug abusers of both genders had childhood AD/HD. Among cocaine abusers, a study using a semistructured interview and parental information concluded that 35%[12] had childhood AD/HD, while a study using the WURS reported that 50%[8] of cocaine abusers had childhood AD/HD. Prevalence of child-

hood AD/HD suspected in our study was consistent with that in previous studies of drug abusers, representing more frequent childhood AD/HD histories than in the general population.[22] Other studies have also described AD/HD as the most common comorbidity existing with substance use disorder,[25] and reported that individuals with childhood AD/HD showed alcohol and cannabis abuse more frequently than those without an AD/HD history.[26] These findings confirm a close relationship between drug abuse and childhood AD/HD.

Some researchers have not considered AD/HD as a direct etiology of drug abuse. Modestin and Wurmle reported that substance use disorders were not caused by childhood AD/HD, but instead reflected a conduct disorder.[6] In the present study, we did not evaluate past histories of conduct disorder and presence of antisocial personality disorder in our prison sample, although higher prevalence of such disorders were likely to exist than in the general population. Therefore, we are not able to address this issue, and this point was an important limitation of our study.

In the present study, prisoners with an illicit drug addiction also had less education than those without an illicit drug addiction. Murphy *et al*. have reported that children with AD/HD were more likely to fail in school life because of their attention deficit symptoms.[27] Therefore, the difference in educational histories between the two groups may reflect a higher prevalence of childhood AD/HD in prisoners with an illicit drug addiction. In the present study, ages when smoking and drinking were started were lower in drug-abusing prisoners than in others. Childhood AD/HD may be associated with early initiation of legal substance use such as smoking and drinking, which has been linked to an increased risk of illicit drug use in previous studies.[2,27]

However, here, we should consider one of important limitations in this study, that is, a self-reporting bias concerning prior use of illicit drugs on more than one occasion. Illicit drug abusers might be contaminated by the prisoners accidentally experiencing illicit drugs, while nonabusers might be contaminated by the prisoners failing to report their drug use on several occasions. To reduce these possibilities, it might be a better method that prisoners with prior use of illicit drugs on more than several occasions were compared with those without illicit drug use.

Relationships between childhood attention deficit/hyperactivity disorder and drug choice

We also addressed the issue of childhood AD/HD tendencies influencing specific drug choice. Toluene abusers showed significantly higher scores on the WURS than cannabis abusers, and included a higher proportion of subjects with a score of at least 46 compared to MAP and cannabis abusers. Reflecting on these tendencies, toluene abusers were likely to have the least education among the three groups of drug abusers, while cannabis abusers were likely to have considerable education as Wada previously described in a study that investigated cocaine abuse in Japan.[28]

These above findings conflict with our hypothesis that Japanese drug abusers with AD/HD might prefer to choose MAP as opposed to other drugs, nor are they consistent with previous studies describing drug abusers with childhood AD/HD as preferring stimulants to suppressants as a form of self-medication.[11–14,16,29] However, findings in the present study are consistent with those in our previous study, that WURS scores in inpatients abusing inhalants (including toluene and butane) were significantly higher than those in inpatients abusing MAP.[21] Absence of differences in drug choice among drug abusers with and without childhood AD/HD tendencies may account for the preference of the suppressants by the subjects in the present study. Alternatively, these subjects might prefer suppressants to stimulants if drug abusers with childhood AD/HD tendencies prefer toluene to MAP. Apart from alcohol, toluene is the most popular suppressant in Japan.[15] Clure *et al*. supported the former explanation, maintaining that no differences in drug choice existed between drug abusers with and without childhood AD/HD.[24] In contrast, Resnick supported the latter explanation, stating that some drug abusers with AD/HD avoid stimulants because these cannot make them feel 'high', owing to the paradoxical effect often seen with stimulant therapy in individuals with AD/HD.[30]

The latter explanation is interesting from the viewpoint of self-medication. According to Wada and Fukui, toluene is a cheaper, more familiar psychoactive substance than MAP, actually representing a 'gateway' drug leading to more addictive substances such as MAP.[31] Although most Japanese drug abusers generally initiate abuse with toluene in their teen years, they later 'graduate' to give up toluene and become either MAP abusers or abstainers from all illicit drugs. In the present study, MAP abusers were somewhat older than toluene abusers, possibly reflecting such graduation phenomenon. Therefore, we suspect that drug abusers with childhood AD/HD were somehow unable to graduate from inhalants, continuing the use of toluene for self-medicating AD/HD symptoms with its sedative effects.

Although the present study could not show a clear relationship between drug abusers with AD/HD and

drug choice, we demonstrated that drug-abusing Japanese prisoners with childhood AD/HD tendencies might not be likely to choose MAP over other drugs.

Limitations

The present study includes several important limitations, as follows:

(i) The Japanese version of the WURS has not been standardized, and general validity and availability have not been established even though internal consistency and reliability were demonstrated.
(ii) We evaluated childhood AD/HD tendencies without a structured interview and parental information. Childhood AD/HD, therefore, might have been overdiagnosed, if the WURS failed to distinguish completely between AD/HD and early onset of depression, despite being able to discriminate AD/HD patients from normal control subjects.[20] Considering previous studies of cocaine abusers, prevalence of childhood AD/HD was higher when evaluated by the WURS than by a semistructured interview and parental information (50%[8] vs. 35%[12]), although both studies shared common findings. A high WURS score may not mean clinical diagnosis of childhood AD/HD but only childhood hyperactive tendencies, although we obtained findings common with another study using a smaller sample in a medical setting,[21] which may partly confirm the validity of this instrument.
(iii) We did not evaluate childhood histories of treatment for AD/HD, past histories of conduct disorder, and presence of an antisocial personality disorder.
(iv) The sample size for this study was relatively small.
(v) We did not examine how many times each group of drug abusers previously experienced the other drugs, such as use of toluene in a MAP abuser or use of MAP in toluene abusers. Unless experiencing the other drugs at least once, each group of drug abusers was not likely to have the opportunity to choose a preferred drug.

Despite these limitations, this study carries important clinical implications. Evaluation of childhood AD/HD is important for diagnosing comorbid adult AD/HD in drug abusers, since drug abuse in the presence of AD/HD is more difficult to treat than abuse without AD/HD.[32] Additionally, abusers with AD/HD are at risk of severe behavioral disorders such as impulsive and antisocial behavior.[25] They may also benefit from pharmacotherapy with other dopamine agonists, which have seen some success with cocaine-abusing patients.[16,29] Detection of comorbid AD/HD, therefore, is necessary for treatment of drug abusers. Further well-designed research is required to overcome the limitations mentioned above.

REFERENCES

1. Wilens TE, Mick E, Faraone SV, Spencer T. Attention deficit hyperactivity disorder (ADHD) is associated with early onset substance use disorders. *J. Nerv. Ment. Dis.* 1997; **185**: 475–482.
2. Biederman JWT, Mick E, Faraone SV, Spencer TJ. Does attention-deficit hyperactivity disorder impact the developmental course of drug and alcohol abuse and dependence? *Biol. Psychiatry* 1998; **44**: 269–273.
3. Milberger SBJ, Faraone SV, Wilens T *et al.* Associations between ADHD and psychoactive substance use disorders. Findings from a longitudinal study of high-risk siblings of ADHD children. *Am. J. Addict.* 1997; **6**: 318–329.
4. Biederman JWT, Mick E, Milberger S *et al.* Psychoactive substance use disorders in adults with attention deficit hyperactivity disorder (ADHD): effects of ADHD and psychiatric comorbidity. *Am. J. Psychiatry* 1997; **152**: 1652–1658.
5. Molina BS. Childhood predictors of adolescent substance use in a longitudinal study of children with ADHD. *J. Abnorm. Psychol.* 2003; **12**: 497–507.
6. Modestin JMB, Wurmle O. Antecedents of opioid dependence and personality disorder: attention-deficit/hyperactivity disorder and conduct disorder. *Eur. Arch. Psychiatry Clin. Nuerosci.* 2001; **1**: 42–47.
7. Storm-Mathisen A, Vaglum P. Conduct disorder patients 20 years later: a personal follow-up study. *Acta Psychiatr. Scand.* 1994; **89**: 416–420.
8. Horner BR. Prevalence and implications of attention-deficit hyperactivity disorder among adolescents in treatment for substance abuse. *J. Am. Acad. Child Adolesc. Psychiatry* 1997; **36**: 30–36.
9. Wilson JJ, Levine FR. Attention deficit hyperactivity disorder (ADHD) and substance use disorders. *Curr. Psychiatry Rep.* 2001; **3**: 497–506.
10. Wilens TE, Biederman J, Gunawardene S. Doses stimulant therapy of attention-deficit/hyperactivity disorder beget later substance abuse? A meta-analytic review of the literature. *Pediatrics* 2003; **111**: 179–185.
11. Cocores JA, Mueller PS, Gold MS. Cocaine abuse and adult attention deficit disorder. *J. Clin. Psychiatry* 1987; **48**: 376–377.
12. Carroll KM. History and significance of childhood attention deficit disorder in treatment-seeking cocaine abusers. *Compr. Psychiatry* 1993; **34**: 75–82.
13. Levine FR. Attention-deficit hyperactivity disorder and substance abuse: relationship and implications for treatment. *Harv. Rev. Psychiatry* 1995; **2**: 246–258.
14. Levine FR, Kleber HD. Prevalence of adult attention-deficit hyperactivity disorder among cocaine abusers seeking treatment. *Drug Alcohol Depend.* 1998; **52**: 15–25.

15. Grebermann SB, Wada K. Social and legal factors related to drug abuse in the United States and Japan. *Public Health Rep.* 1994; **109**: 731–737.
16. Schubiner HSK, Arfken CL, Johanson CE *et al.* Double-blind placebo-controlled trial of methylphenidate in the treatment of adult ADHD patients with comorbid cocaine dependence. *Exp. Clin. Psychopharmacol.* 2002; **10**: 286–294.
17. Iwanami A, Sugiyama A, Kuroki N *et al.* Patients with methamphetamine psychosis admitted to a psychiatric hospital in Japan. A preliminary report. *Acta Psychiatrica. Scand.* 1994; **89**: 428–432.
18. Wada K. Drug abuse in Japan: a brief history and the current situation. *Epidemiologic Trends in Drug Abuse. Community Epidemiology Work Group, II. Proceedings* NIDA, Rockville, 1999, 331–341.
19. Matsumoto T, Kamijo A, Miyakawa T *et al.* Methamphetamine in Japan: the consequences of methamphetamine abuse as a function of route of administration. *Addiction* 2002; **97**: 809–818.
20. Ward MF, Wender PH, Reimherr FW. The Wender Utah Rating Scale: an aid in the retrospective diagnosis of childhood attention deficit hyperactivity disorder. *Am. J. Psychiatry* 1993; **150**: 885–890.
21. Matsumoto T, Kamijo A, Yamaguchi A *et al.* Childhood histories of attention-deficit/hyperactive disorders in Japanese methamphetamine and inhalant abusers: a preliminary report. *Psychiatry Clin. Neurosci.* 2005; **59**: 102–105.
22. Lynskey MT, Hall W. Attention deficit hyperactivity disorder and substance use disorders: is there a causal link? *Addiction* 2001; **96**: 815–822.
23. Schubiner HTA, Milberger S, Lockhart N *et al.* Prevalence and conduct disorder among substance abuses. *J. Clin. Psychiatry* 2000; **61**: 244–251.
24. Clure CBK, Saladin ME, Johnson D *et al.* Attention-deficit/hyperactivity disorder and substance use: symptom pattern and drug choice. *Am. J. Drug Alcohol Abuse* 1999; **25**: 441–448.
25. Aviram RB, Rhum M, Levine FR. Psychotherapy of adults with comorbid attention-deficit/hyperactivity disorder and psychoactive substance use disorder. *J. Psychother Pract. Res.* 2001; **10**: 179–186.
26. Murphy KR, Barkley RA, Bush T. Young adults with attention deficit hyperactivity disorder: subtype differences in comorbidity, educational, and clinical history. *J. Nerv. Ment. Dis.* 2002; **190**: 147–157.
27. Milberger SBJ, Faraone SV, Chen L *et al.* Further evidence of an association between attention-deficit/hyperactivity disorder and cigarette smoking. Findings from a high risk sample of siblings. *Am. J. Addict* 1997; **6**: 205–217.
28. Wada K. Cocaine abuse in Japan. *Jpn. J. Alcohol Drug Depend.* 1994; **29**: 83–91.
29. Levine FR, McDowell DM, Kleber HD. Methylphenidate treatment for cocaine abusers with adult attention-deficit/hyperactivity disorder: a pilot study. *J. Clin. Psychiatry* 1998; **59**: 300–305.
30. Resnick RJ. *The Hidden Disorder: a Clinician's Guide to Attention Deficit Hyperactivity Disorder in Adults.* American Psychological Association, Washington, DC, 2000.
31. Wada K, Fukui S. Relationship between years of methamphetamine use and symptoms of methamphetamine psychosis. *Jpn. J. Alcohol Drug Depend.* 1990; **25**: 143–158 (in Japanese).
32. Wilens TE, Mick E. Does ADHD affect the course of substance abuse? Finding from a sample of adults with and without ADHD. *Am. J. Addict.* 1998; **7**: 156–163.