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# The prescription of dexamphetamine to patients with schizophrenia and amphetamine dependence

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Patients with a severe mental illness such as schizophrenia have significant rates of concurrent amphetamine use. Such dual diagnosis patients have been shown to have poorer treatment outcomes. Often, they do not comply with treatment plans and have frequent episodes of hospitalization. There is growing evidence for the role of prescribed dexamphetamine in the treatment of amphetamine dependence. The prescription of dexamphetamine to patients with schizophrenia and amphetamine dependence has not been previously reported. Eight schizophrenic patients are described to whom dexamphetamine has been prescribed, with information being extracted retrospectively from case notes. In four out of eight cases, the prescription of dexamphetamine led to apparently good progress both in terms of substance misuse and psychiatric health. In two cases, progress was more equivocal, but appeared to produce some benefit. Two cases could be judged as treatment failures, but the condition and situation of the patients were not worse at the end of treatment than at the beginning. Compliance with neuroleptics increased in most cases. No patients exhibited exacerbation of psychosis as a result of treatment. The rate of outcome success is satisfactory when consideration is given to the difficult nature of this patient group, and their previous failure to respond to intensive treatment. It is argued that benefits may be gained from increased compliance with psychiatric treatment in patients prescribed amphetamine, and that this may outweigh possible risks. However, any conclusions are tentative in view of the nature of this study. A small open-label prospective study is recommended.

**Key words:** amphetamine, comorbidity, schizophrenia, substance abuse

## Introduction

After cannabis, amphetamine is the second most widely used illicit drug in the UK (Pickering and Stimson, 1994). Most amphetamine use is recreational with the drug being taken orally; however, a significant but unknown proportion of amphetamine users develop dependence and experience pronounced withdrawal symptoms on stopping the drug (Topp and Dark, 1997). Amphetamine is often injected and injectors are more at risk of infection with blood-borne viruses than heroin injectors (Klee, 1992). Amphetamine use is also associated with high levels of criminality (Brooke *et al.*, 1998).

Patients with a severe mental illness such as schizophrenia have significant rates of concurrent amphetamine use (Menezes *et al.*, 1996). Such dual diagnosis patients have been shown to have poorer treatment outcomes (Bartels *et al.*, 1993). Often, they do not comply with treatment and have frequent episodes of hospitalization. There is no clear indication from research as to the best way to treat these patients, although some form of assertive outreach has often been advocated.

There is growing evidence for the role of prescribed dexamphetamine in the treatment of amphetamine dependence. Several recent studies have shown positive changes in patients prescribed dexamphetamine; for example, reduced drug use and injecting, and improvements in physical and psychological health (Pates *et al.*, 1996; Klee *et al.*, 1997; McBride *et al.*, 1997; Charnaud and Griffiths, 1998; White, 2000). To date, no randomized controlled trials have been completed (although one is currently in progress) but, nonetheless, dexamphetamine is widely prescribed. In England and Wales, more than 100 doctors prescribe dexamphetamine for over 1000 patients (Strang and Sheridan, 1997). Furthermore, dexamphetamine prescribing is viewed as having an important role in managing dependence by 60% of addiction specialists (Bradbeer *et al.*, 1998). Nonetheless, dexamphetamine substitution is thought to carry a risk of amphetamine psychosis and treatment remains controversial (Mattick and Darke, 1993).

The Government's Task Force to Review Services for Drug Misusers concluded: 'There may be a role for amphetamine substitution prescribing in some cases but further research is

needed. Preliminary reports from small-scale open studies suggest that further study of this different form of substitute prescribing should be undertaken. Any prescribing should be in the context of careful evaluation' (Task Force, 1996).

The prescription of dexamphetamine to patients with schizophrenia and amphetamine dependence has not been previously described. Initially, it might seem a dangerous intervention. Amphetamine can produce a psychosis indistinguishable from schizophrenia (Connell, 1958) and indeed amphetamine psychosis has been seen as a 'model' psychosis providing evidence for the dopamine hypothesis of schizophrenia (Snyder *et al.*, 1974). Some schizophrenic patients are more sensitive than controls to the 'psychotogenic' effects of amphetamine (Yui *et al.*, 1999). It is possible therefore that amphetamine could exacerbate their illness.

The schizophrenic patient with problematic amphetamine use, however, may fail with abstinence based treatments. Their continued use of amphetamine may lead to non-compliance with antipsychotic medication, financial and accommodation difficulties, criminal activity and injecting problems. Furthermore, the irregular and chaotic use of amphetamine of unknown purity may result in failure to establish tolerance and increasing exacerbation of their underlying schizophrenic illness.

It is therefore possible that the prescription of dexamphetamine to schizophrenic patients who are dependent on amphetamine may improve their condition if conducted under conditions of close supervision.

As an initial contribution to this debate, eight schizophrenic patients are described to whom dexamphetamine was prescribed. The information has been extracted retrospectively from case notes.

### Clinical approach

Patients included self-referrals, and referrals from general practitioners, mental health teams and other substance misuse services. The authors' Trusts include both substance misuse and mental health teams, with good coordination between them. The substance misuse teams themselves include psychiatric expertise, and have long experience of treating amphetamine misuse with and without prescription of dexamphetamine.

A full assessment was made of substance misuse, and of psychiatric symptoms and history. Particular attention was given to psychotic symptoms, and their interaction with drug misuse, and to a careful risk assessment. A history of significant violence was taken as a relative contraindication to starting dexamphetamine treatment. This would include convictions for assault or descriptions of violent behaviour in previous notes. In most cases, a treatment plan was formulated in coordination with the mental health team, and involving monitoring and support of the patient by both teams. In some cases, however, the patient was unwilling to engage with the mental health team. In these cases, the substance misuse team alone supervised treatment. However, all the substance misuse teams involved in the study included trained psychiatric nurses. Patients underwent regular multi-disciplinary review meetings (initially every 3 months).

Patients were considered suitable for dexamphetamine treatment where there was a history of long-term regular use of street amphetamine in significant quantities (e.g. over 2 g per day on most days over 1 year or more), and previous failure to abstain after advice. The maximum dose of dexamphetamine was calculated by

matching the estimated dose of street amphetamine taken, assuming the usual local level of 5% purity. In practice, patients were usually started at approximately one-half this dose, and adjusted upwards only if considered clinically appropriate. They were told that continued prescription would depend on compliance with neuroleptics, and with other aspects of routine treatment.

Treatment involved normal psychiatric supervision. In addition, the following treatment interventions for stimulant misuse were available as appropriate:

- (1) Provision of literature on amphetamine including advice on how to stop using and lead a drug-free lifestyle.
- (2) Motivational interviewing.
- (3) Review of recent behaviour using retrospective drug diary and discussion of cues, coping, lapse management, etc.
- (4) General advice on healthy lifestyles, including advice on diet, rest, sleep, coping with 'crashing' (the withdrawal syndrome of low mood, tiredness and irritability).
- (5) Harm minimization advice, including advice on safer injecting, use of syringe exchange schemes.
- (6) Referral to appropriate non-drug agency if needed for other social issues.
- (7) Acupuncture and other complementary medicines.

Patients were prescribed 5 mg dexamphetamine tablets, mostly on a daily pick-up basis except at weekends. If there was evidence of injecting tablets, this would have been changed to dexamphetamine elixir (1 mg/1 ml). In practice, this did not happen in this series of patients. Dexamphetamine elixir was not used routinely as it is significantly more expensive than dexamphetamine tablets, is not readily available from community pharmacists, and because independent research has found that injecting dexamphetamine tablets rarely occurs and, where it does, is experimental and does not persist (Klee *et al.*, 1997).

Consumption of street amphetamine was monitored by urine tests, which distinguish between the use of prescribed dexamphetamine and street amphetamine (Tetlow and Merrill, 1998). This relies on measuring the relative concentrations of amphetamine stereoisomers. Significant amounts of L-amphetamine indicate the use of street amphetamine. Urine tests were requested at least monthly, and there were no problems with compliance in this regard. Use of street amphetamine did not lead to immediate suspension of the prescription, but was discussed fully in clinic sessions. Regular inspection was made of injecting sites in all cases.

### Case reports

#### Case 1

The patient was male, aged 45 years, divorced and living alone. He was diagnosed as suffering from schizophrenia 15 years previously, and subsequently had been receiving neuroleptics. He was referred from mental health team and currently was taking haloperidol decanoate, 150 mg, every 3 weeks, but compliance has been poor. He was persistently thought disordered, but has not required hospital admission for the last 10 years. There were recent concerns about self-care, partly related to spending money on amphetamine. He had been taking amphetamine in small quantities

since he was a teenager but, over the last 3 years, use has increased. On assessment, he was injecting 1–2 g amphetamine at least five times per week. Injections sites were mostly in arms, and none were infected. He was started on dexamphetamine 20 mg/day, which was increased to 40 mg a day after reassessment at 4 weeks. This has now been kept steady for 9 months. Compliance with neuroleptics has been good. Urine tests reveal no street amphetamine. Thought disorder was still present, but less marked and self-care improved significantly. The patient has stopped injecting. At present, he does not want to decrease his dosage of dexamphetamine.

#### *Case 2*

The patient was male, aged 46 years. He had a 25-year history of schizophrenia with numerous admissions both voluntary and under the Mental Health Act. Prominent negative symptoms with poor self-care and low motivation were observed, but also episodes of florid delusions and hallucinations. He was prescribed fluphenazine decanoate 100 mg every 3 weeks, but was poorly compliant with medication. He had a history of intermittent drug misuse since adolescence. He started using amphetamine at age 30 years, with increasing amounts over recent years, taken orally. He was referred by mental health team. On assessment, he was taking 4 g of street amphetamine a day on average. He was started on 80 mg/day dexamphetamine, with neuroleptic continued at same dose. He demonstrated good compliance with medication afterwards, and his mental state gradually improved. He became less withdrawn with improved self-care, and had no further acute episodes. He usually restricted himself to prescribed dexamphetamine but, on occasions, he bought extra street amphetamine. After 3 years, he was asked to reduce dexamphetamine. This was gradually reduced and stopped over 6 months. At the same time, fluphenazine was reduced to 50 mg every 3 weeks. Improvement in self-care and abstinence from amphetamine have been maintained over the 1 year since dexamphetamine was stopped.

#### *Case 3*

The patient was male, aged 25 years. He was separated, and living with his parents. He had a history of schizophrenia since the age of 17 years. He had numerous admissions with florid psychosis. He was prescribed haloperidol decanoate 100 mg every 2 weeks but demonstrated poor compliance with treatment. He started using amphetamine at age 24 years, with apparent exacerbation of schizophrenic symptoms. He was referred by mental health team. On assessment, he was taking 2–3 g of street amphetamine a day by injection. He was worried by his drug use, but said that he could not stop. He was started on 65 mg/day dexamphetamine, and continued on same dose of neuroleptic. Dexamphetamine was reduced and stopped over 4 months. Compliance with neuroleptics was good. During withdrawal, he had one episode of agitation which led to an overnight stay in hospital. He reported that this was caused by smoking teabags! He remained abstinent over the next 6 months, but then was readmitted to hospital with a relapse of his schizophrenia. This proved refractory to treatment, and he has now been in hospital for over 18 months. However, he has remained abstinent of amphetamine.

#### *Case 4*

The patient was male, aged 41 years. He was partially separated, and had three children. He had a 13-year history of paranoid

schizophrenia with preceding heavy cannabis use and moderate oral stimulant use. Initially, he was prescribed a variety of medication, including olanzapine and amitriptyline, but adherence was generally poor. Frequent psychotic relapses occurred and were managed effectively by his community psychiatric nurse and general psychiatrist. Cannabis use diminished but amphetamine use increased, and was now taken intravenously. The partial separation from his wife and children was attributed to intraenous amphetamine use and its negative effect on mood, temperament and financial status. His paranoid ideation and auditory hallucinations were constant but usually manageable with depot neuroleptic pipothiazine, 50 mg/month. He frequently complained of increasing lethargy and slowed thoughts. At the time of referral to the stimulant clinic, he was taking 3 g of street amphetamine a day, funded by petty theft. He was also heavily in debt. He was started on a prescription of dexamphetamine, 50 mg/day. He was monitored by both psychiatric and drug abuse services. There was no exacerbation of his schizophrenia but he still injected illicit amphetamine, albeit in smaller quantities. Dexamphetamine prescription was increased from 50 mg to 75 mg a day with a marked reduction in the use of illicit amphetamine. Currently, he regards the prescription as adequate for his stimulant dependency whilst acknowledging several other significant benefits; diminished financial hardship, reduced contact with substance using peers, less criminality and improved psychomotor activity.

#### *Case 5*

The patient was male, aged 23 years. He was single and had moved into the area 1 year ago, to stay with his grandmother and 'get away from drugs', with a self-referral to the drug team. He was diagnosed as schizophrenic 4 years previously. He was treated in his previous area with flupenthixol 40 mg every 2 weeks, trifluoperazine 1 mg/day and risperidone 1 mg/day. However, compliance was very poor, and he was often out of touch with services. He had several brief emergency admissions with florid psychosis. On assessment, he described grandiose delusions and occasional auditory hallucinations. He was taking 2–3 g of amphetamine a day by mouth, and 0.5 g of heroin by smoking. He had taken no neuroleptic medication for 3 months. He refused admission but was started on dexamphetamine 60 mg/day and flupenthixol 40 mg every 2 weeks. He successfully came off heroin with a reducing course of dihydrocodeine over 6 weeks, and has not used it since. His compliance with neuroleptics has since been good, and he has had weekly contact with our service. His drug use has been variable. On occasions, he has purchased extra amphetamine, particularly at weekends. His mental state has been generally better, but there have been two brief episodes of deterioration, which coincided with heavy bouts of amphetamine use and, on one occasion, with a visit to Ibiza, when he did not take his neuroleptics and drank a lot of alcohol. After being thrown out by his grandmother during one of these episodes, he has been found supported accommodation. Over the last 6 months, he has been working in his grandfather's garage business.

#### *Case 6*

The patient was male, aged 38 years. He started using amphetamine at the age of 20 years, and had been using it daily for more than 10 years, approximately 2–3 g both orally and by injection. He was diagnosed 12 years previously as suffering from paranoid schizophrenia with a marked affective component. He has

been followed up by the local forensic service because of threats to kill the former husband of his girlfriend, apparently as a result of delusional beliefs. Following discussion with other involved services, he was started on 45 mg dexamphetamine daily. In addition, he received depot pipothiazine, 100 mg weekly. This did not alter significantly during treatment. At times, he was also prescribed amitriptyline, mirtazepine and zopiclone. Since commencing in treatment 17 months ago, he has had three further hospital admissions with exacerbations of his psychosis. These have all been depressive with thoughts of self-harm. There has been no exacerbation of his paranoid symptoms or threats to others. He reported using much less street amphetamine, although there have been periods of relapse. Of 32 urines tested during treatment, 17 (53%) were positive for prescribed amphetamine only, 10 (31%) were positive for street amphetamine, two (6%) were positive for amphetamine but no amphetamine stereoisomer ratio was available, and three were negative for amphetamine (although he always insisted he was collecting and taking his supplies).

#### Case 7

The patient was male, aged 31 years. He was single, and has moved frequently between districts. Schizophrenia was diagnosed at age 20 years. He has a history of numerous admissions in different hospitals under the Mental Health Act, and two brief prison sentences. Has never complied with medication. He started amphetamine at age 24 years 'because it made him feel better' than the medication prescribed by doctors. He was taking up to 4 g per day by mouth. He funded his habit by shoplifting. He started on dexamphetamine 40 mg/day in combination with clopixon 200 mg every 2 weeks. He was told that an increase would be considered if he started to stabilize. He never complied consistently with medication, and continued to buy large amounts of street amphetamine. He was admitted under Section 3 after 6 months, and dexamphetamine was stopped. His mental state improved in hospital, but deteriorated again on discharge after 2 months. He moved district again, and was later detained again under Section 3 in a different hospital.

#### Case 8

The patient was male, aged 33 years. He was living with his parents at the time of referral to the stimulant clinic. He was using 2 g amphetamine a day intravenously. He had a history of unstable paranoid schizophrenia for a decade with several involuntary admissions and a prison sentence for burglary. Neuroleptic adherence was generally poor and complicated by marked extrapyramidal symptoms for 2–3 days after injection. He received, in turn, haloperidol decanoate 100 mg every 4 weeks, clopenthixol 200 mg every 2 weeks, flupenthixol 60 mg every 4 weeks and pipothiazine 100 mg every 4 weeks. Extrapyramidal symptoms have been least severe on the latter injection, which he is currently taking. Nonetheless, adherence has been poor and he received approximately one-half of the prescribed injections. Auditory hallucinations and delusional beliefs were prominent and stable regardless of degree of intoxication. He believed that 'he lacked the internal ability to generate sufficient energy' (probably a result of negative symptoms), hence his use of amphetamine. Heroin and illicit methadone were used several times a month when amphetamine was unavailable, which served to compound the sedative effect of the neuroleptics. He complained frequently of

financial hardship, parental hostility and dissatisfaction with quality of 'street' amphetamine. He would not take part in care programme meetings and avoided any psychological therapy. Dexamphetamine 50 mg was commenced with a weekly clinic review, but compliance was poor. He lost interest in the treatment when his expectations of greater psychoactive effects were not met. His treatment ended quickly. Monitoring of his mental state did not reveal significant changes attributable to dexamphetamine.

## Discussion

In four out of eight cases (cases 1–4) the prescription of dexamphetamine led to apparently good progress both in terms of substance misuse and psychiatric health. In two cases, progress is more equivocal, but appears to be producing some benefit. Two cases could be judged as treatment failures, but the condition and situation of the patients were no worse at the end of treatment than at the beginning. This outcome rate is satisfactory, when considering the difficult nature of this patient group, and their previous failure to respond to intensive treatment. However, it must be acknowledged that this is by no means a formal research study. It is an opportunistic retrospective study, based on the finding that eight patients in three different treatment services were undergoing this unusual form of therapy. Therefore, there is no standardized form of assessment involved. Any conclusions drawn must be extremely tentative but, at the very least, it is feasible to induce a highly selected group of non-compliant dual diagnosis patients to attend for psychiatric treatment with some regularity.

Drug misuse treatment is often now based on a 'harm reduction' model. The aim is to lessen damage to patients in the areas of health and personal and social welfare, and to reduce criminal activity. Sometimes, this involves prescribing substitute medication, such as methadone. This produces benefits by providing an uncontaminated form of drug, taking the patient away from the drug market and reducing the need to fund the habit by criminal activity. It is accepted that substitute prescriptions may produce further benefits by increasing retention in treatment and ensuring regular contact with services.

Schizophrenic patients who abuse drugs may be particularly in need of this form of treatment. Clinical experience suggests that they are more likely to come to harm through drug misuse than other drug users. If they inject, they are less good at ensuring that they use clean equipment, which is perhaps why the prevalence of blood born viral infection is increasing in the schizophrenic population (Kelly *et al.*, 1995). If they commit crimes, they are more likely to get caught. They are also more likely to experience financial difficulties, exposing themselves to self-neglect and the risk of violence from drug dealers. Their unconventional behaviour when intoxicated is also a risk factor for violence. They are more likely to become homeless, and to be thrown out of accommodation that has been found for them. For all these reasons, they are a particularly vulnerable group of patients, who are particularly in need of regular and tolerant support.

The huge advantage of the treatment described above was that patients were seen regularly and, for the most part, took their neuroleptic medication regularly. As a result, their mental state improved, and they were able to receive the benefits of advice and support directed at health and welfare needs. In one case, it proved possible to reduce neuroleptic medication without deterioration of

mental state. Patients were also exposed more regularly to substance misuse advice and, in two cases, reduced and stopped their drug intake. The difficulty treatment services face in engaging with 'dual diagnosis' patients is well documented (Sainsbury Centre for Mental Health, 1998). Seivewright and McMahon (1996) have argued that the integration into mental health case management of practical substance misuse approaches based on harm reduction may help overcome this problem. This study shows that a form of treatment based on this approach can be clinically useful.

It did not appear that prescribed dexamphetamine exacerbated psychotic symptoms, such as hallucinations and delusions. In most cases, patients improved, except when they embarked on brief binges of purchased street amphetamine. There is some evidence that amphetamine can improve certain features of schizophrenia. When added to maintenance neuroleptic treatment in 48 patients with chronic schizophrenia, 32 patients reported an improvement and 22 showed increased work efficiency. Patients with florid symptoms did better than those with entirely negative symptoms (Cesarec and Nyman, 1985). In contrast, Sanfilippo *et al.* (1996) showed some improvement only of severe negative symptoms on treatment with amphetamine compared to placebo. In another study (Goldberg *et al.*, 1991), some patients who received a single dose of dexamphetamine while under treatment with haloperidol showed improvement in concept formation and, in affect, cooperation and engagement with the environment. The investigators concluded that the combination of amphetamine and haloperidol could produce relatively selective enhancement of cortical dopaminergic activity.

These results are somewhat contradictory, and are based on brief episodes of treatment with a small number of patients. However, they do challenge the notion that amphetamine necessarily exacerbates schizophrenia. Many schizophrenic patients initially take amphetamines because they find it makes them feel better (Dixon *et al.*, 1990). It is possible that they may be correct in this perception.

The present study indicates that regular doses of amphetamine (up to 80 mg/day) in conjunction with neuroleptics are not for the most part harmful to patients. Combined with other measures, it produces significant clinical improvement in many cases. In particular, the inducement of a dexamphetamine prescription may increase contact with mental health services and compliance with physical and psychological treatment. A methodical small-scale, open-label trial would be justified.

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## References

- Bartles S J, Teague G B, Drake R E, *et al.* (1993) Service utilization and costs associated with substance use disorder among severely mentally ill patients. *J Nerv Mental Dis* 181: 227-232
- Bradbeer T M, Fleming P M, Charlton P, Crichton J S (1998) Survey of amphetamine prescribing in England and Wales. *Drug Alcohol Rev* 17: 299-304
- Brooke D, Taylor C, Gunn J, Maden, A (1998) Substance misusers remanded to prison – a treatment opportunity. *Addiction* 93: 1851-1856
- Cesarec Z, Nyman A K (1985) Differential response to amphetamine in schizophrenia. *Acta Psychiatr Scand* 71: 5523-5538
- Charnaud B, Griffiths V (1998) Levels of intravenous drug misuse among clients prescribed oral dexamphetamine or oral methadone: a comparison. *Drug Alcohol Depend* 52: 79-84
- Connell P H (1958) Amphetamine psychosis. Maudsley monograph no. 5. Oxford University Press, London
- Dixon L, Haas G, Weiden P, Sweeney J, Frances A (1990). Acute effects of drug abuse in schizophrenic patients: Clinical observations and patients' self reports. *Schizophr Bull* 16: 69-79
- Goldberg T E, Bigelow L B, Weinberger D R, Daniel D G, Kleinman J E (1991) Cognitive and behavioral effects of the co-administration of dextroamphetamine and haloperidol in schizophrenia. *Am J Psychiatry* 148: 178-184
- Kelly J, Heckman T, Helfrich S, Mence R, *et al.* (1995). Risk factors and behaviours among men in a Milwaukee homeless shelter. *Am J Public Health* 85: 1585
- Klee H (1992) A new target for behavioral research – amphetamine misuse. *Br J Addict* 87: 439-446
- Klee H, Wright S, Rothwell J, Reid P, Morris J, Carnwath T, Merrill, J (1997) Amphetamine use and treatment: a study of individual and policy impediments to effective service delivery. Report to the Department of Health Task Force to Review Services for Drug Users. Centre for Social Research and Substance Abuse, Manchester Metropolitan University, Manchester
- Mattick R, Darke S (1995) Drug replacement treatments: is amphetamine substitution a horse of a different colour? *Drug Alcohol Rev* 14: 389-394
- McBride A J, Sullivan G, Blewett A E, Morgan S (1997) Amphetamine prescribing as a harm reduction measure: a preliminary study. *Addiction Res* 5: 95-112
- Menezes PR, Johnson, S., Thornicroft G, *et al.* (1996) Drug and alcohol problems among individuals with severe mental illnesses in South London. *Br J Psychiatry* 168: 612-619
- Pates R, Coombes N, Ford N (1996) A pilot programme in prescribing dexamphetamine for amphetamine users. *J Subst Misuse* 1: 80-84
- Pickering H, Stimson G (1994) Prevalence and demographic function of stimulant use. *Addiction* 89: 1385-1390
- Sainsbury Centre for Mental Health (1998) Keys to engagement: review of care for people with severe mental illness who are hard to engage with services. The Sainsbury Centre for Mental Health, London
- Sanfilippo M, Wolkin A, Angrist B, van Kammen D P, Duncan E, Wieland S, Cooper T B, Peselow E D, Rotrosen J (1996) Amphetamine and negative symptoms of schizophrenia. *Psychopharmacology* 123: 211-214
- Seivewright N, McMahon, C. (1996). Misuse of amphetamines and related drugs. *Adv Psychiatr Treatment* 2: 211-218
- Snyder S H, Bannerjee S P, Yamamura H I, Greenberg D (1974) Drugs, neurotransmitters, and schizophrenia. *Science* 184: 1243-1253
- Strang J, Sheridan J (1997) Prescribing amphetamines to drug misusers: data from the 1995 national survey of community pharmacies. *Addiction* 92: 833-838
- Task Force to Review Services for Drug Misusers. 1996 Report of an independent review of drug treatment services in England. Department of Health, London
- Topp L, Darke S (1997) The applicability of the dependence syndrome to amphetamine. *Drug Alcohol Depend* 48: 113-118
- White R (2000) Dexamphetamine substitution in the treatment of amphetamine abuse: an initial investigation. *Addiction* 95: 229-238
- Yui K, Goto K, Ikemoto S, Ishiguro T, Angrist B, Duncan G E, Sheitman B, Lieberman J A, Bracha S H, Ali S F (1999) Neurobiological basis of relapse prediction in stimulant-induced psychosis and schizophrenia. *Mol Psychiatry* 4: 512-523