

Heroin and cocaine co-use in a group of injection drug users in Montréal

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Objective: To describe the pattern of co-use of heroin and cocaine in individuals who were not receiving methadone maintenance treatment. **Design:** Structured interviews. **Setting:** Community hospital. **Participants:** Individuals ($n = 1111$) selected from a cohort of out-of-treatment injection drug users in Montréal, Que. **Outcome measure:** Frequency (injections per day) and quantity (number of days of use) of heroin, cocaine and speedball (the simultaneous administration of heroin and cocaine) use reported in the month preceding the interview. **Results:** About 50% of the sample reported using only cocaine intravenously (C group), about 8% reported using only heroin (H group) intravenously and about 15% reported using both heroin and cocaine (HC group) intravenously. Reported cocaine consumption was similar in the HC and C groups. Heroin was used on fewer days by the HC than by the H group, but the number of injections per day was similar. Speedball use, which was quantified independently from heroin and cocaine use, was reported almost exclusively by the HC group, and speedball was used less often than either heroin or cocaine alone. Finally, a similar proportion of individuals in the C and the HC groups consumed alcohol in the 24 hours preceding the interview, but a larger proportion of individuals in the HC group reported the use of marijuana. **Conclusion:** In a cohort of injection drug users in Montréal, cocaine was the most prevalent illicit drug. Furthermore, about 70% of the heroin users also injected cocaine, but not in the form of speedball. Thus, the sequential co-use of heroin and cocaine is highly prevalent in Montréal and deserves particular clinical attention.

Objectif : Décrire la tendance de la consommation simultanée d'héroïne et de cocaïne chez des personnes qui ne suivent pas un traitement de maintenance à la méthadone. **Conception :** Entrevues structurées. **Contexte :** Hôpital communautaire. **Participants :** Sujets ($n = 1111$) choisis parmi une cohorte d'utilisateurs de drogues injectables non traités à Montréal (Qué.). **Mesure de résultats :** Fréquence (nombre d'injections par jour) et quantité (nombre de jours d'utilisation) d'héroïne, de cocaïne et de «speedball» (administration simultanée d'héroïne et de cocaïne) déclarée d'utilisations au cours du mois précédant l'entrevue. **Résultats :** Environ 50 % des sujets de l'échantillon ont déclaré utiliser seulement la cocaïne (groupe C), environ 8 %, seulement l'héroïne (groupe H), et environ 15 %, à la fois l'héroïne et la cocaïne (groupe HC), tous par voie intraveineuse. La consommation déclarée de cocaïne se ressemblait chez les sujets des groupes HC et C. Les sujets du groupe HC ont consommé de l'héroïne pendant moins de jours que ceux du groupe H, mais le nombre d'injections par jour se ressemblait dans les deux cas. La consommation du «speedball», quantifiée indépendamment de celle d'héroïne et de cocaïne, a été déclarée presque exclusivement par des sujets du groupe HC, et le «speedball» a été consommé moins souvent que l'héroïne ou la cocaïne seulement. Enfin, un pourcentage semblable de sujets des groupes C

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et HC avaient consommé de l'alcool au cours des 24 heures précédant l'entrevue, mais un pourcentage plus élevé de sujets du groupe HC ont déclaré fumer de la marijuana. **Conclusion :** Dans une cohorte d'utilisateurs de drogues injectables à Montréal, la cocaïne était la drogue illicite la plus prévalente. De plus, environ 70 % des consommateurs d'héroïne s'injectaient aussi de la cocaïne, mais non sous forme de «speedball». La consommation simultanée séquentielle d'héroïne et de cocaïne est donc très prévalente à Montréal et mérite une attention clinique particulière.

Introduction

It is important to study the incidence and patterns of polydrug use, because a large proportion of drug users regularly consume more than one substance. The concomitant use of opioid drugs and cocaine is one type of polydrug use that has been documented in diverse subgroups of the drug-using population. The prevalence of cocaine use in untreated heroin-dependent individuals ranges from 30% to 80%.¹⁻⁸ Similarly, high rates of cocaine use have been observed in individuals in methadone maintenance programs, at entry as well as during follow-up.^{3,9-18}

The negative health and social consequences of cocaine use by opioid-dependent individuals are severe and have been well documented. Because users of opioids typically self-administer cocaine by the intravenous route,^{2,4,6,9,12,18,19} and because cocaine has a short half-life, the frequency of injection is high.^{9,12,13} Frequent injections, coupled with widespread sharing of syringes,^{3,12,20} increase the risk of contracting human immunodeficiency virus (HIV) and other bloodborne infectious diseases.^{12,21-23} Cocaine use inevitably makes the drug habit of opioid-dependent individuals more expensive,^{24,25} leading them to engage in income-generating strategies that often include criminal activities.^{3,4,13,21,24} Furthermore, a high level of cocaine use at intake has been shown to be an independent predictor of poor treatment outcome for heroin-dependent polydrug abusers,²⁶ and it has been reported that cocaine-using opioid addicts are more likely to drop out of treatment and relapse^{18,27-29} than pure heroin users.

Although there is abundant anecdotal and clinical evidence documenting the existence and relevance of this polydrug use, neither the relation between self-administration of heroin and cocaine nor the reasons for this type of polydrug use are known. In a recent review of clinical and preclinical data relevant to this issue,³⁰ we noted that cocaine use by opioid-dependent individuals can occur simultaneously or sequentially, and both patterns may be observed in the same individual. Among drug users, the simultaneous injection of heroin and cocaine is often referred to as "dynamite," "whizbang" or, more commonly, as "speedball."^{31,32} However, heroin users, as well as individuals

on methadone maintenance treatment, also report cocaine use separate from opioid administration,³⁰ but we are aware of no study that addresses the relative prevalence of simultaneous and sequential co-use of heroin and cocaine directly.

Here, we report an analysis of heroin-cocaine co-use in a sample of 1111 injection drug users who were not enrolled in any treatment program. In this sample, the following issues were investigated: the prevalence of simultaneous (i.e., speedball) and sequential heroin-cocaine co-use; the quantity and frequency of drug intake in subjects who consumed heroin or cocaine alone versus subjects who co-used both substances; and the prevalence of alcohol and marijuana consumption in subjects who consumed heroin alone, cocaine alone or both.

Methods

Sample

The sample ($n = 1300$) used in the present analysis came from a source population of injection drug users who were interviewed between July 1999 and August 2001 as part of a longitudinal study with ongoing recruitment since 1988 on the risk of HIV infection among illicit drug users in Montréal conducted at the Hôpital St-Luc du Centre hospitalier universitaire de l'Université de Montréal (CHUM).³³ This study was approved by the Comité d'éthique de la recherche du CHUM.

Cohort eligibility criteria included being 14 years of age or older, residing in Montréal and having injected drugs within the past 6 months. Subjects were either self-referred or referred by treatment programs, shelters, needle-exchange programs or friends. Injection drug users who were admitted for detoxification at St-Luc Hospital were also systematically offered the opportunity to participate in the study. Subjects received a small stipend (\$10) for participation. Once subjects had given their informed consent, they completed a confidential questionnaire administered by a trained interviewer. The questionnaire was divided into several sections that provided data on sociodemographic variables, health history, drug and alcohol use and re-

lated behaviours, sex behaviour, and knowledge about AIDS and HIV infection. Follow-up interviews were sought 3 months after the initial one, and every 6 months thereafter.

Procedure

The 1300 participants answered 1 or more questionnaires between July 1999 and August 2001. On the basis of their intravenous (IV) drug use in the month preceding the interview, 4 groups were created: no heroin and no cocaine (NHC), heroin only (H), cocaine only (C), and heroin and cocaine (HC). The subjects who reported having used prescribed methadone in the month preceding the interview were identified and selectively removed from the groups of interest. This was done because the doses of prescribed methadone were not identified at the time of the interview. The following information about drug use in the month preceding the interviews was extracted from the questionnaire(s) of the remaining subjects: the number of days of IV heroin use, the total number of injections of heroin, the number of days of IV cocaine use, the total number of injections of cocaine, the number of days of speedball use, the number of injections of speedball, and the proportion of subjects who had consumed alcohol or marijuana, or both, in the last 24 hours of IV drug use.

In order to have an index of frequency of drug injection, the reported number of injections was divided by the number of days of use. When a subject answered more than 1 questionnaire (i.e., baseline and follow-up questionnaires), only the questionnaire with the highest number of reported drug injections was included in the analysis. As a result, this study specifically describes the most intense level of IV drug use in individuals not taking methadone. The focus on this group reflects our interest in studying a severe drug habit, presumably unrestrained by participation in any form of treatment.

Data analysis

All statistical analyses were performed using χ^2 tests for categorical variables, t tests for continuous variables measured in independent groups and paired t tests for continuous variables measured in the same group.

Results

Of the 1300 subjects, 30.3% ($n = 394$) reported having used neither heroin nor cocaine in the month preceding the interview, and 10.4% ($n = 41$) of these individuals were taking prescribed methadone; 47.2% ($n = 614$)

reported having used only cocaine, and 7.5% ($n = 46$) of these individuals were on methadone; and 7.9% ($n = 103$) reported having used only heroin, and 46.6% ($n = 48$) of these individuals were on methadone. Thus, most of the sample was composed of those who injected cocaine, and about half of the active injectors of heroin in this cohort reported the use of prescribed methadone. Finally, 14.5% ($n = 189$) reported having used both heroin and cocaine in the month preceding the interview, and 28.6% ($n = 54$) of these participants were on methadone. After removing the subjects who were taking methadone, the remaining sample was composed of 1111 untreated "injectors."

Most participants were male (964 [86.7%]) and French-speaking (966 [86.9%]), with a mean age of 38.6 (range 15–68) years. The mean time since the participants' first injection was 14.2 (range < 1–43) years. Most participants (941 [84.7%]) were unemployed at the time of interview, and 289 (26.0%) reported living in unstable conditions, such as shelters, apartments rented on a monthly basis or on the street.

The number of subjects in each group, the mean number of days of injection drug use and the mean number of injections per day are listed in Table 1. Three-hundred and fifty-three (31.8%) participants reported no heroin or cocaine injections in the past month. Among those who injected, most of the sample (74.9%) was composed of IV users of cocaine. Only 7.0% (53/758) of the sample reported using IV heroin exclusively, whereas 17.8% (135/758) of the sample reported using both IV heroin and IV cocaine. In other words, of all of those who reported IV heroin use in the preceding month, 71% also reported using IV cocaine.

Table 1, Fig. 1 and Fig. 2 illustrate a few important features of heroin and cocaine use and co-use. Among injectors of either heroin (H group) or cocaine (C group), heroin was used on a greater number of days than was cocaine ($t_{621} = 3.57$, $p < 0.001$). Heroin use tended to be quite regular (47% of users reported injecting between 20 and 30 days a month), whereas cocaine use was more sporadic (57% of users reported injecting between 1 and 10 days a month). This difference in distribution was significant ($\chi^2 = 19.6$, $p < 0.001$). Although cocaine use was more sporadic in terms of number of days used, when it was used, it was injected significantly more often than heroin ($t_{621} = 5.74$, $p < 0.001$). Among users uniquely of cocaine, 52% injected between 3 and 8 times a day, whereas among users uniquely of heroin, 66% injected between 1 and 2 times a day. This difference in distribution was statistically significant as well ($\chi^2 = 73.3$, $p < 0.001$).

When IV heroin and IV cocaine use in single-drug and polydrug users was compared, polydrug users

(HC group) reported significantly fewer days of heroin use ($t_{188} = 2.71, p = 0.007$), and a significantly different distribution of days of heroin use was found ($\chi^2 = 6.97, p = 0.030$). The use of cocaine did not differ between the HC and C groups (see Table 1 and the last panels of Fig. 1 and Fig. 2). In addition, the number of injections of heroin and cocaine per day did not differ between single-drug and polydrug users (Fig. 2). Thus, total IV drug use in these polyusers was high and appeared to be the result of 2 coexisting drug habits.

Of the 135 subjects in the HC group, 45 answered 1 follow-up questionnaire, 18 answered 2, and 13 answered 3. It was possible, therefore, to estimate the stability of reported co-use over time by calculating the concordance of co-use in the same subject. This analy-

sis revealed that co-use fluctuated. Of the subjects who answered 1, 2 or 3 follow-up questionnaires, 40%, 22% and 0% reported co-use on the other questionnaire(s), respectively; 44%, 44% and 66% reported cocaine use on the other questionnaire(s) respectively; whereas 7%, 17% and 23% reported heroin use on the other questionnaire(s), respectively. Thus, in this sample, cocaine use was the most stable.

Among polydrug users who answered more than 1 questionnaire and who reported using heroin only ($n = 9$) or cocaine only ($n = 36$) in a second questionnaire, it was possible to compare the number of days of use and the number of injections per day when they were using both drugs or only 1 drug (Table 2). As in the initial analysis, the questionnaires with the highest reported

Table 1: Characteristics of drug use in a sample ($n = 1111$) of out-of-treatment injection drug users

Group*		No. of subjects	Drug (and route)	Mean no. (and SD)	
				Days of use	Injections/d
No heroin	No cocaine (NHC)	353	NA	0	0
	Cocaine (C)	568	Cocaine (IV)	11.4 (9.5)	8.1 (7.1)
	No cocaine (H)	55	Heroin (IV)	16.3 (11.8)	2.2 (1.4)
Heroin	Cocaine (HC)	135	Heroin (IV)	11.4 (11.6)	2.2 (1.1)
			Cocaine (IV)	13.2 (10.4)	9.2 (10.4)

Note: SD = standard deviation; NA = not applicable; IV = intravenous.
*The sample was divided into 4 groups (NHC, C, H and HC) according to the type of drug used in the month preceding the interview.

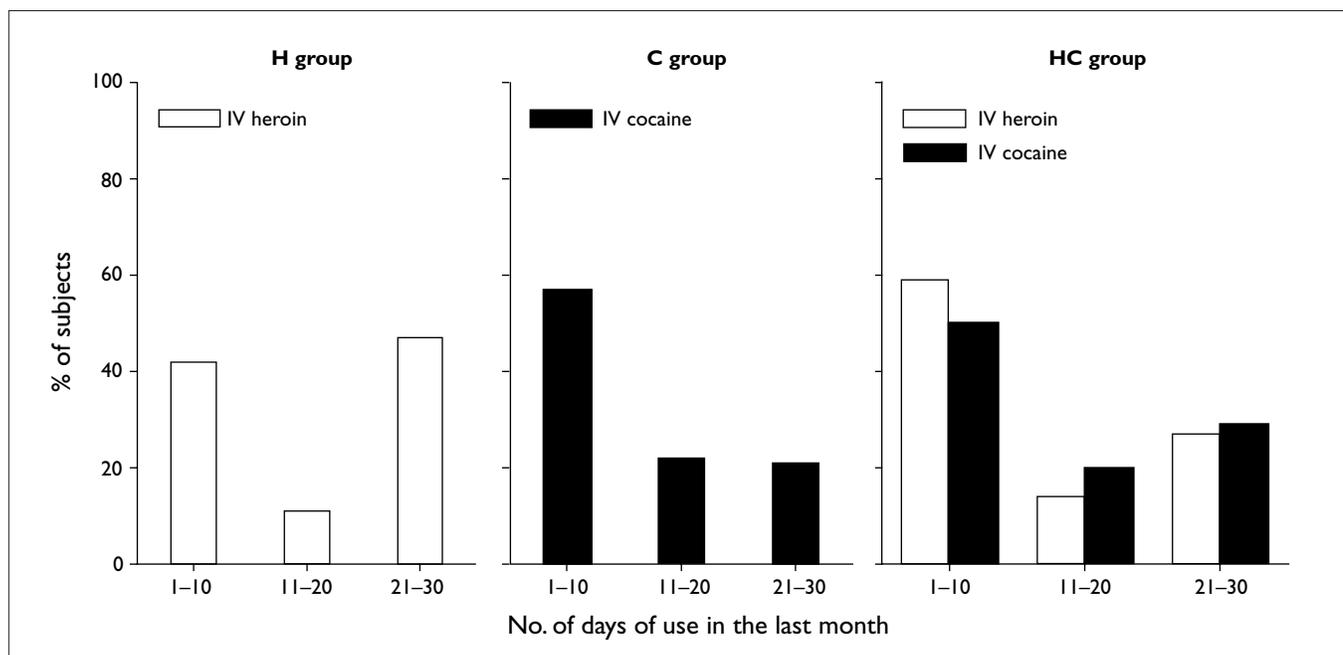


Fig. 1: Number of days of intravenous drug use reported by subjects in the month preceding the interview.

use were used in this analysis. Statistical analyses using paired comparisons revealed no significant difference in either measure during co-use and single use. Thus, these data suggest that the use of one drug did not alter the frequency of use of the other.

Next, we analyzed the use of speedball, but its prevalence was quite low: 0.5% ($n = 3$) in the C group, 3.4% ($n = 2$) in the H group and 21.5% ($n = 29$) in the HC group, that is, the group of sequential co-users of heroin and cocaine. In the HC group, speedball was used significantly less often (mean 4.7 [standard deviation {SD} 4.8] days) than either heroin (mean 10.9 [SD 10.7] days; $t_{28} = 2.89$, $p = 0.006$) or cocaine (mean 14.1 [SD 10.2] days; $t_{28} = 4.98$, $p < 0.001$). In addition, when speedball was used, the mean number of injections per day was similar to heroin but not to cocaine (speedball: mean 2.0 [SD 1.6]; heroin: mean 2.7 [SD 1.6]; cocaine: mean 8.1 [SD 6.4]; speedball v. heroin $p = 0.10$; speedball v. cocaine: $t_{28} = 5.47$, $p < 0.001$). Of those who reported speedball use, 12 completed a second question-

naire and, of these, only 3 individuals reported speedball use at both interviews. Fig. 3 shows the frequency of use of heroin and cocaine in months when speedball was used and when it was not. It can be seen that heroin and cocaine use were not significantly affected by speedball use.

Finally, the proportion of subjects who reported the use of alcohol or marijuana, or both, with cocaine or heroin in the 24 hours before the interview is shown in Table 3. In the H group, a smaller proportion used alcohol than in any other group, whereas marijuana was used by the largest proportion of individuals in the HC group. In both cases, χ^2 tests indicated that the differences in distributions among the 4 groups were statistically significant (alcohol: $\chi^2 = 21.98$, $p < 0.001$; marijuana: $\chi^2 = 7.17$, $p = 0.028$).

Discussion

The primary objective of the present study was to de-

Table 2: Characteristics of drug use when subjects in the HC group reported using only 1 drug in a given month and when the same subjects reported using both drugs in the same month in different questionnaires

	No. of subjects	Either drug used in the month; mean no. (and SD)		Both drugs used in the same month; mean no. (and SD)	
		Days of use	Injections/d	Days of use	Injections/d
Heroin	9	15.7 (12.9)	2.5 (1.5)	14.6 (10.2)	2.6 (1.8)
Cocaine	36	16.1 (12.0)	10.7 (9.6)	16.3 (10.8)	11.0 (12.0)

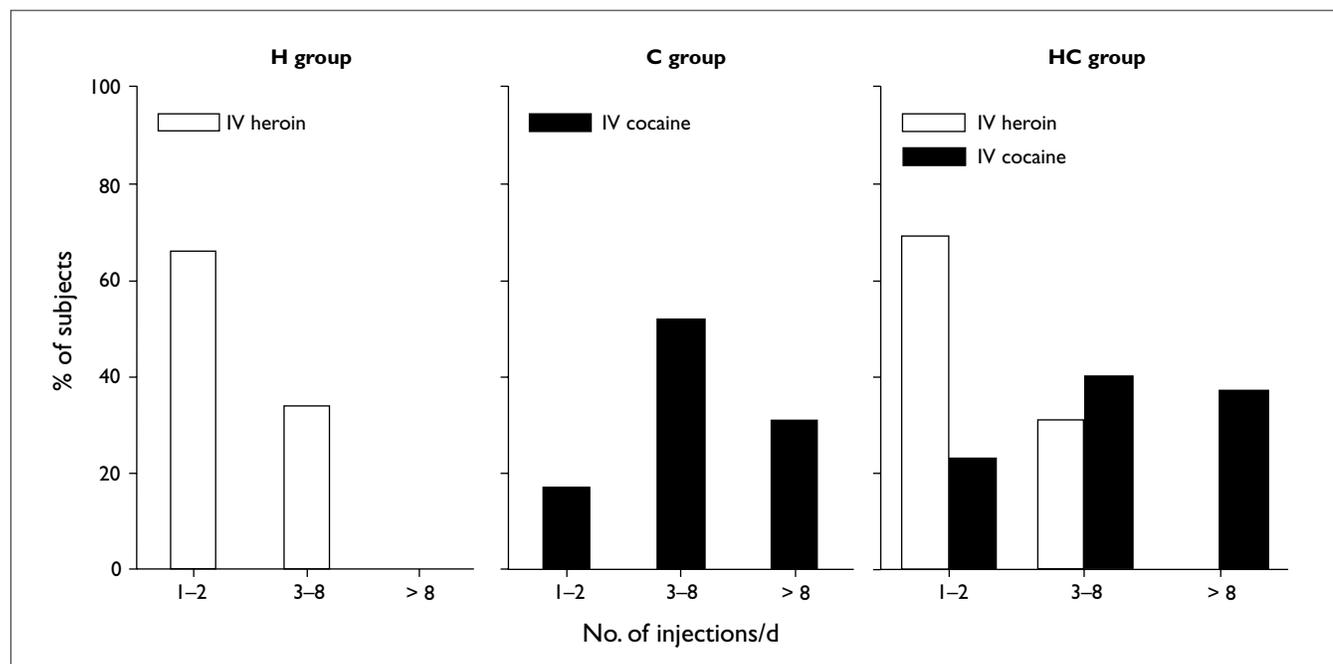


Fig. 2: Number of injections per day reported by subjects in the month preceding the interview.

scribe heroin–cocaine co-use in a group of injection drug users who were not undergoing methadone maintenance treatment. Several important observations were made. First, in this particular sample, heroin–cocaine co-use was more common than heroin use alone; 71% of subjects who reported using IV heroin in the preceding month also reported using IV cocaine. Second, the individuals who reported using both heroin and cocaine (HC group) in the month preceding the interview used cocaine as frequently as the individuals who reported using only cocaine (C group), but

used heroin less often than those who used only heroin (H group). However, no differences between the HC and H groups and between the HC and C groups were found in the number of injections per day of either drug. It appears, therefore, that this sample of co-users was composed primarily of cocaine users who co-used heroin. This conclusion is further supported by the observation that among those co-users who answered more than 1 questionnaire, cocaine use was reported more consistently across questionnaires than either heroin alone or co-use. Third, the use of speedball was reported by a small number of heroin–cocaine co-users who used it less frequently than either heroin or cocaine separately. Interestingly, when used, speedball was injected on average twice a day, as was heroin. Finally, all groups reported the use of ethanol and marijuana. Pure heroin users reported less frequent use of alcohol than the other groups, and co-users reported more frequent use of marijuana. The observation that the C and the HC groups reported equivalent alcohol consumption further supports the inference that the individuals in the HC group were mainly cocaine users using heroin.

Some of the findings from this descriptive study are in accordance with those of previous reports. As is the case in many other cities around the world, a high proportion of opioid–stimulant co-use was found in Montréal.^{1–8,18,23,29,34–38} For example, John et al³⁶ found that, in a group of out-of-treatment intravenous drug users in Denver, about 72% of those who reported the use of opiates in the month preceding the interview also reported using stimulant drugs. Furthermore, as in the present investigation, they found that opioid users injected less frequently than stimulant or opioid–stimulant users and that stimulant and opioid–stimulant users consumed more alcohol than users of opioid drugs only.

One of the interesting findings from the present study was the lack of evidence that use of one drug either increased or decreased use of the other. In fact, it was found that the frequency of cocaine use was not

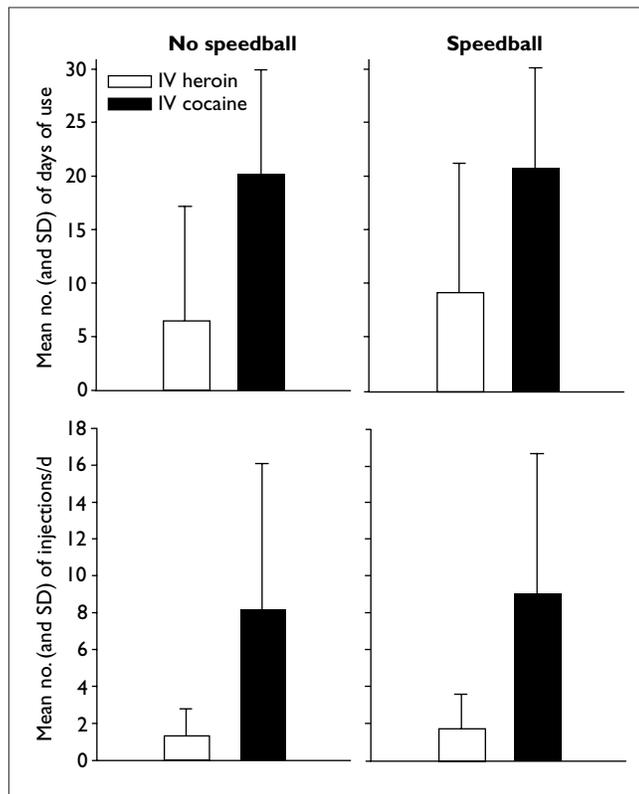


Fig. 3: Mean number of days of use and mean number of injections per day of heroin and cocaine reported by co-users (n = 12) in months when speedball was used and when it was not.

Table 3: Subjects who reported having used alcohol or marijuana, or both, in the 24 hours preceding the interview

Group		No. of subjects	Substance; no. (and %) of users	
			Alcohol	Marijuana
No heroin	No cocaine (NHC)	353	171 (48)	99 (28)
	Cocaine (C)	568	280 (49)	164 (29)
Heroin	No cocaine (H)	55	10 (18)	17 (31)
	Cocaine (HC)	135	53 (40)	55 (41)

changed by heroin co-use (Table 2). Although heroin use was somewhat less frequent in co-users than in those who used heroin only, we attribute this to the fact that among co-users cocaine was the primary drug of abuse.

These results can be contrasted with those of Kidorf and Stitzer,³⁵ who found, in a group of opioid addicts in Baltimore maintained on methadone (about 27 mg/d 3 days a week) that those who used both heroin and cocaine used twice as much cocaine as those who did not use heroin. Similarly, in a study by Beswick et al,³⁹ carried out in the United Kingdom, heroin use was compared in 2 groups of opioid addicts maintained on methadone (58.3 mg/d): those who continued to use heroin only and those who co-used heroin and crack cocaine. Subjects who reported crack use administered heroin more frequently (mean 22.0 days) than those who used only heroin (mean 16.8 days). Therefore, in both of these studies of individuals being treated with methadone, co-use increased the use of heroin and cocaine. Here, we propose that the difference between the results of these 2 studies and the present study arises from the fact that both Kidorf and Stitzer³⁵ and Beswick et al³⁹ studied co-users who were dependent on methadone, whereas, as discussed above, the co-users in the present sample used heroin sporadically and were not taking methadone.

Support for the idea that a history of opioid dependence plays a role in the interaction between heroin and cocaine intake comes from our recent studies in non-dependent and heroin-dependent rats. In rats trained to self-administer either heroin alone, cocaine alone or both drugs⁴⁰ for a limited period of time each day, it was found that the dose-response curves obtained from animals self-administering both drugs were virtually identical to those of animals that self-administer one or the other. These results suggest that, under conditions of limited access to the drugs where animals are unlikely to develop physical dependence, the intake of heroin and cocaine can be relatively independent. Our more recent studies suggest, however, that in rats previously made dependent on heroin, the self-administration of cocaine is enhanced.⁴¹ Furthermore, we found that rats that experienced acute, spontaneous withdrawal from heroin showed a depression in locomotor activity that is reversed by cocaine administration. Importantly, the greater the dose of heroin exposure, the more cocaine is required to reverse the depression of locomotor activity observed during acute withdrawal.

We recognize that the study of the quantity and patterns of heroin-cocaine co-use is complicated by the observation that type, pattern and route of drug intake

are often modulated by nonpharmacologic factors such as drug availability and regional habits of drug administration,^{42,43} social class,^{44,45} age⁴⁶⁻⁴⁸ and gender.^{26,39} Therefore, in the investigation of heroin-cocaine co-use, it is important to distinguish between pharmacologic and nonpharmacologic influences, possibly by studying patterns and quantity of heroin and cocaine intake in different populations⁴⁸ and by testing specific hypotheses about pharmacologic interactions in laboratory animals.

In the present study, the sequential use of heroin and cocaine was reported to be more common than the simultaneous use in the form of speedball. In some populations, speedball use has been described as a highly prevalent practice.^{42,49} In the present sample, however, speedball use was rare and not associated with obvious differences in the quantity and frequency of heroin and cocaine intake. At present, it is not possible to determine whether such differences in the prevalence of speedball use are attributable to local fashion or drug availability, or are related to the degree of opioid dependence.

Finally, in spite of the limitations inherent in the type of study reported here, including the reliance on retrospective self-reported data and the representativeness of the sample, there are some remarkable similarities in the reported frequency of heroin and cocaine use between this and the studies of other groups.^{34,35,39} For example, the number of days of heroin use was 16.3/mo in the present sample and 16.8 in the study by Beswick et al.³⁹ The number of days of cocaine use was 11.4/mo in the present sample and ranged between 9 and 13 days per month in the studies by Kidorf and Stitzer³⁵ and by Ball and Ross.³⁴

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Competing interests: None declared.

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